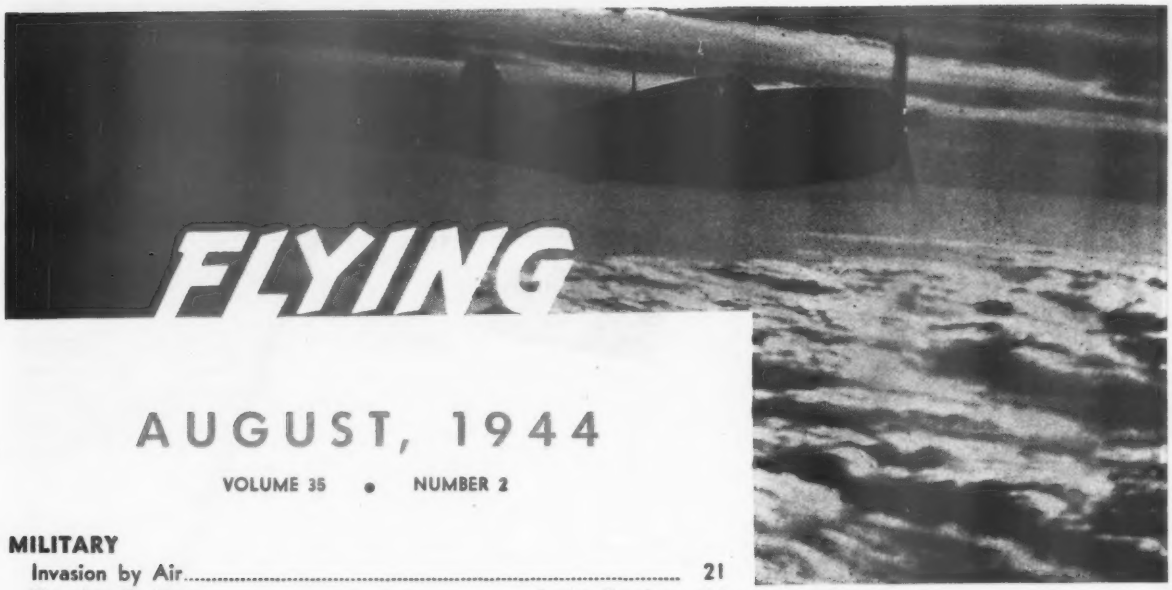

AUGUST, 1944

VOLUME 35 • NUMBER 2

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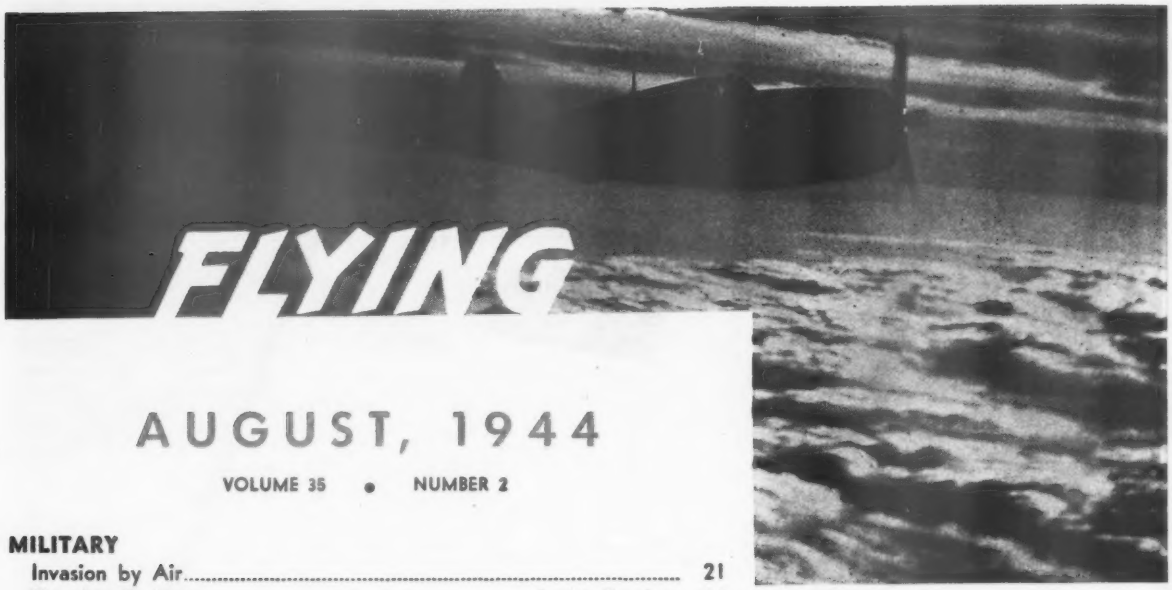

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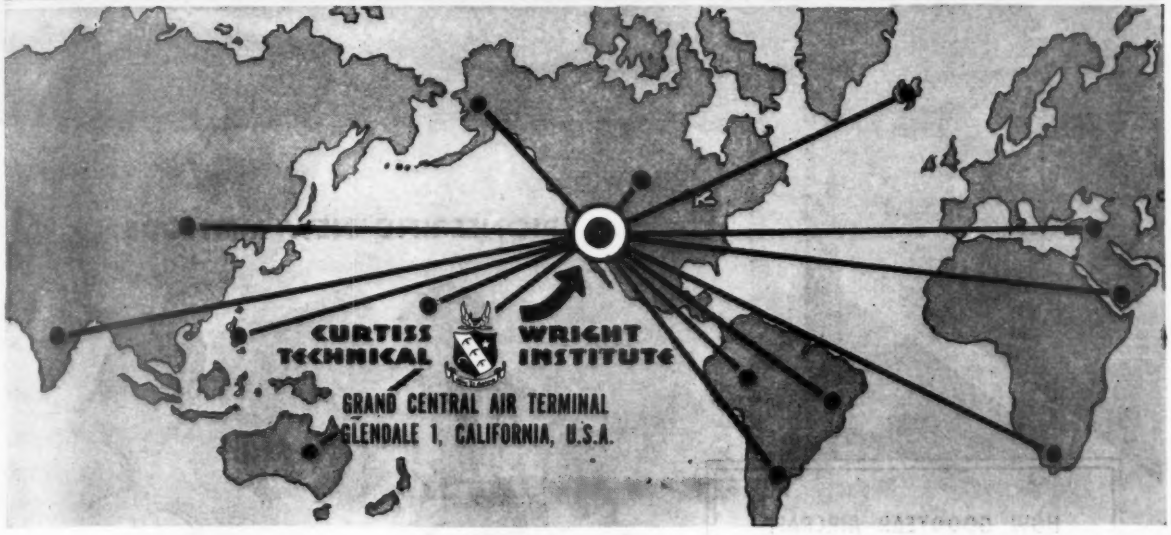

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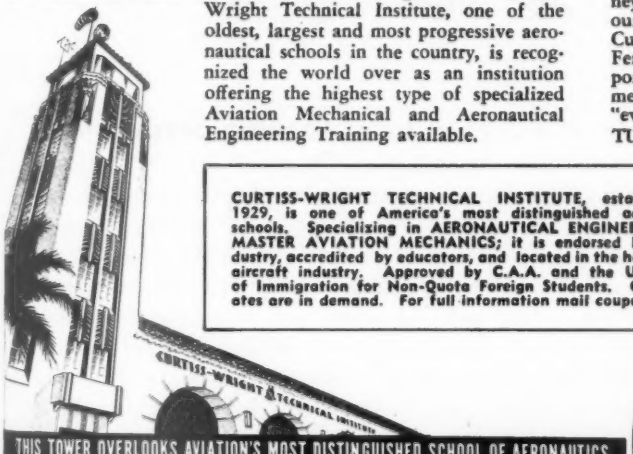

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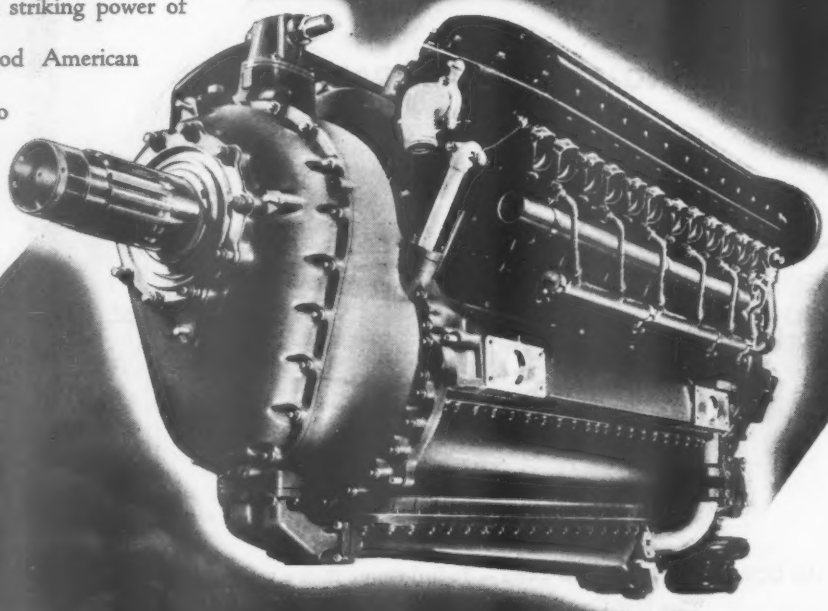

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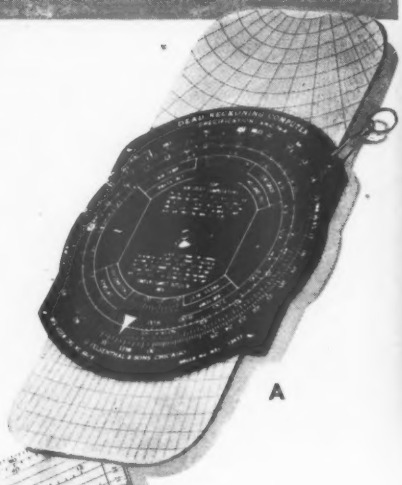

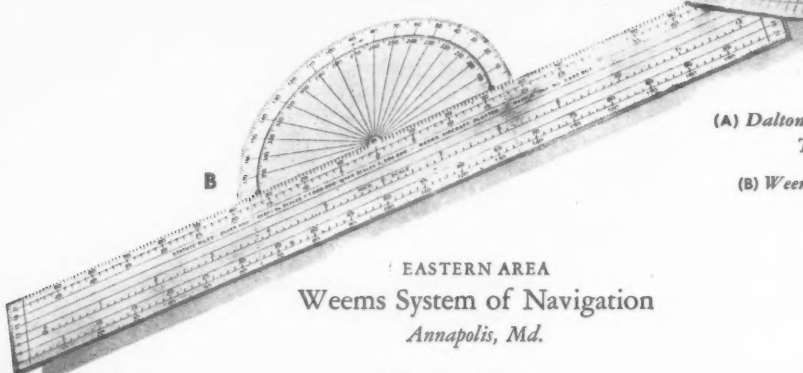

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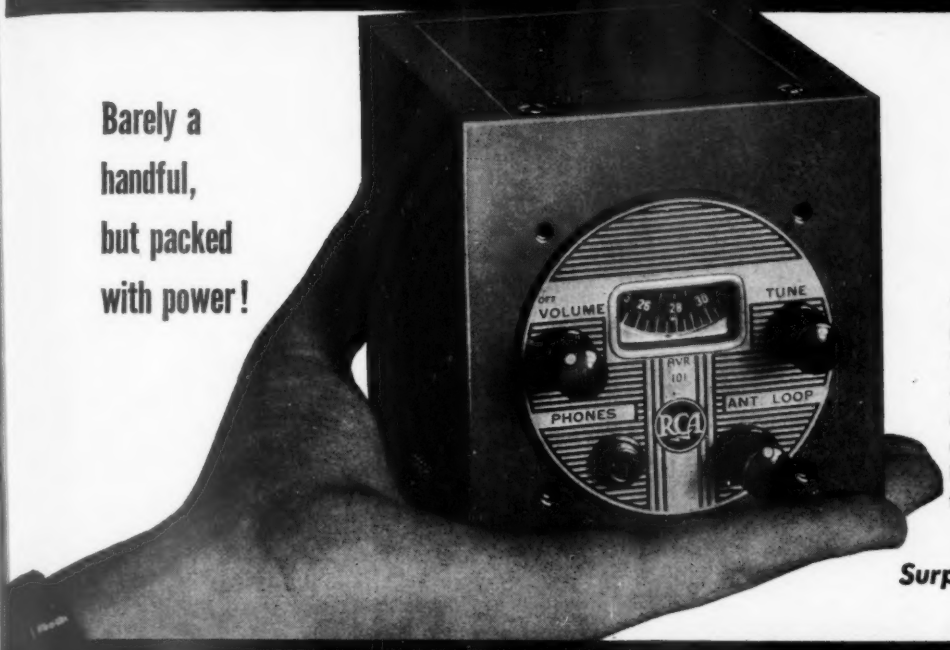

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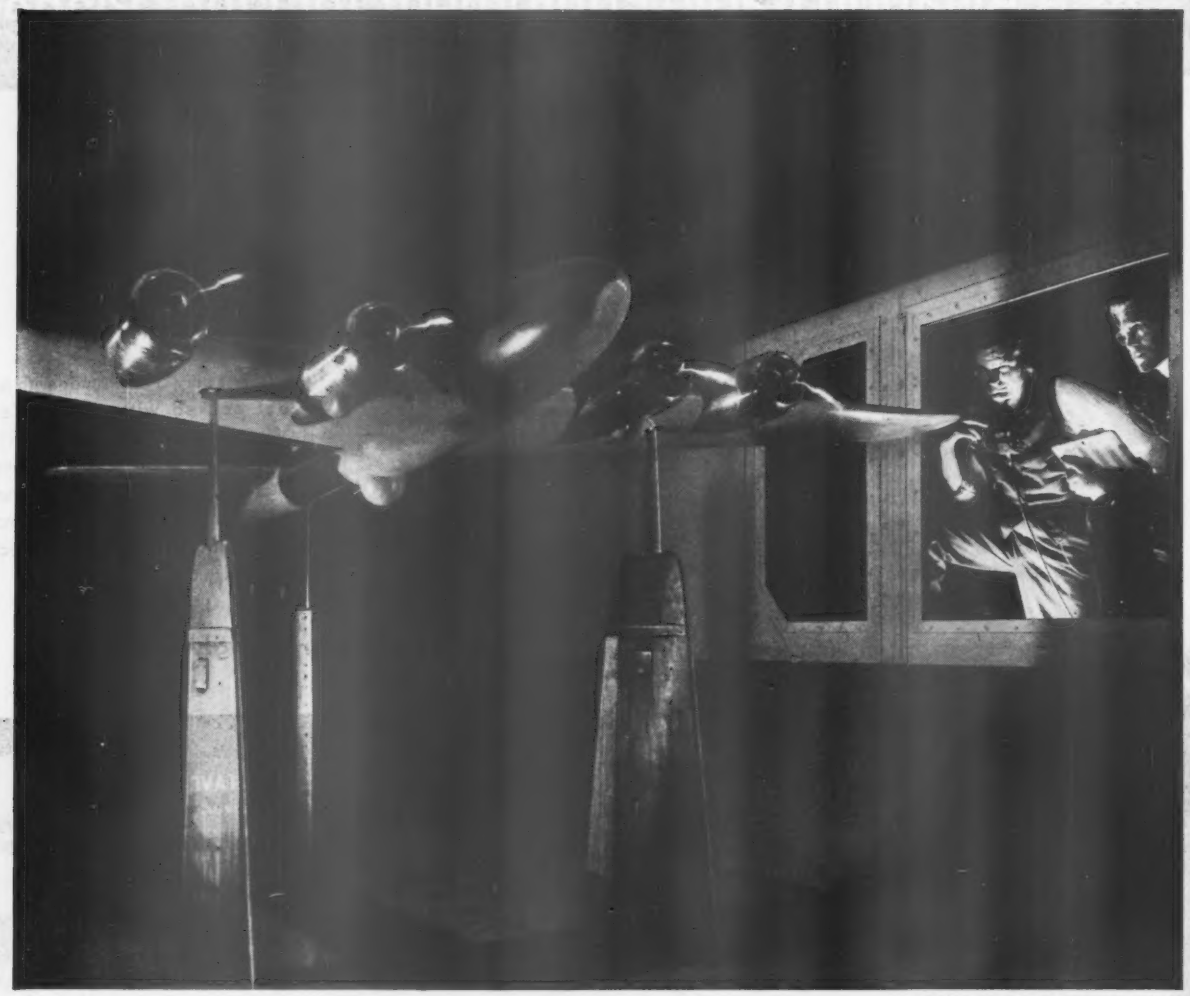

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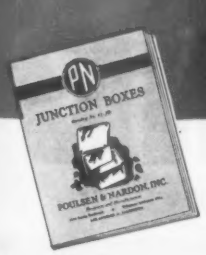

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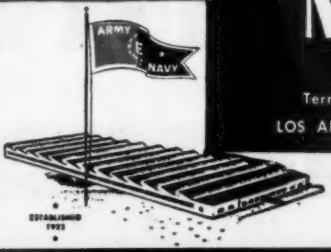

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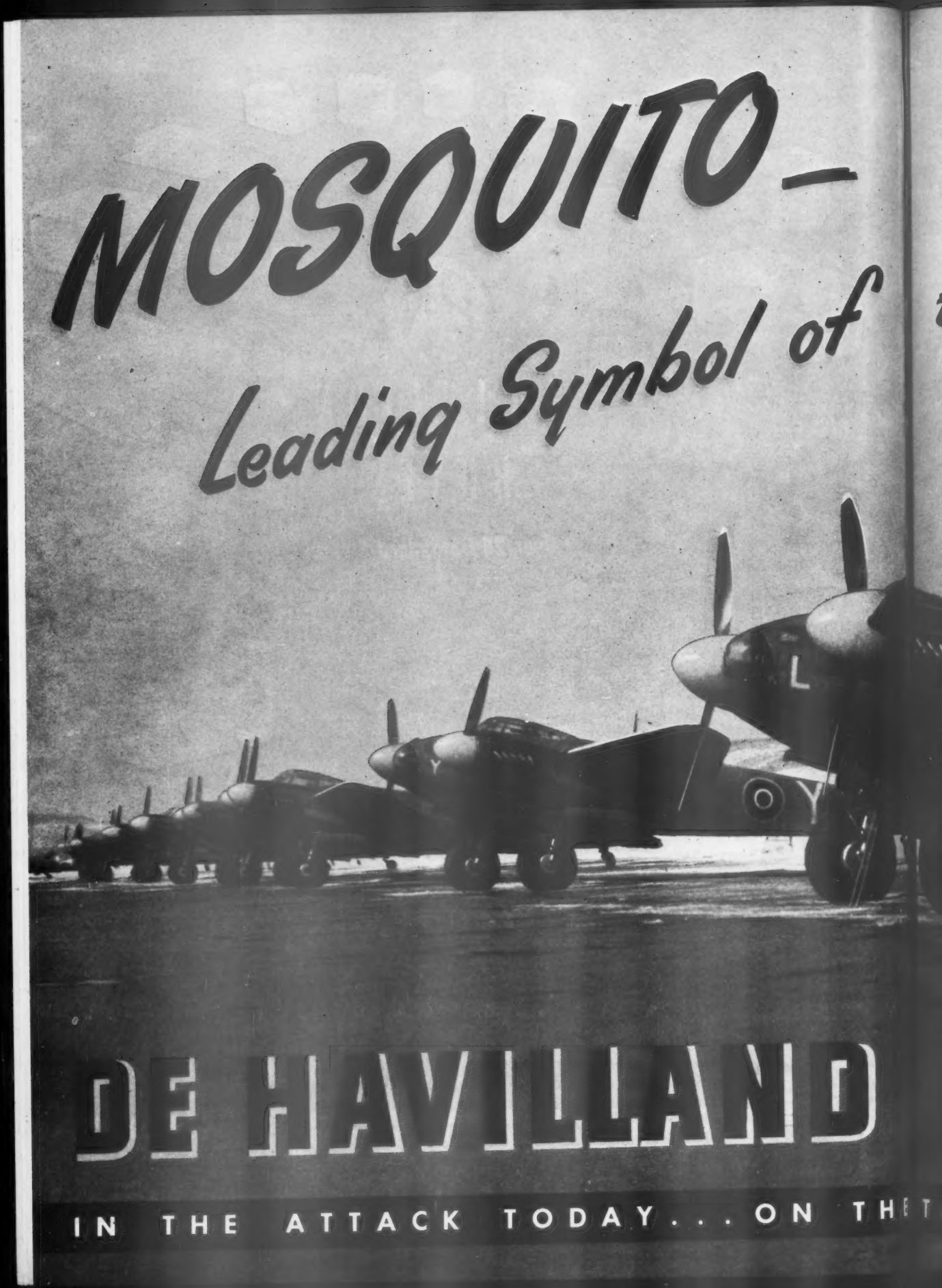
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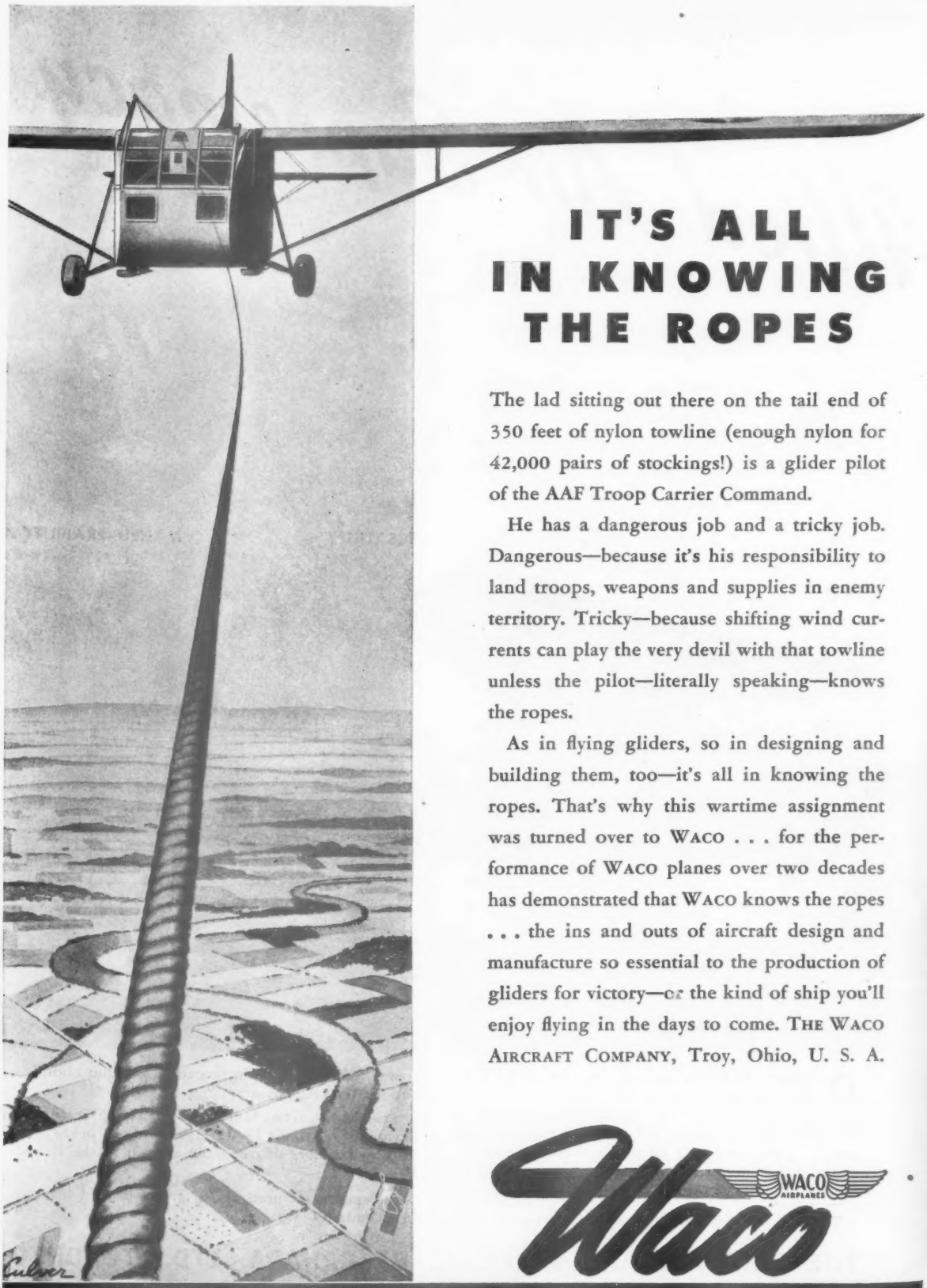

IT'S ALL IN KNOWING THE ROPES

The lad sitting out there on the tail end of 350 feet of nylon towline (enough nylon for 42,000 pairs of stockings!) is a glider pilot of the AAF Troop Carrier Command.

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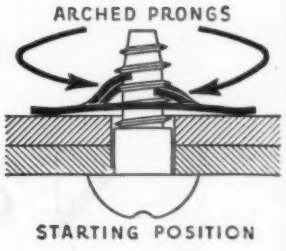

An arched spring lock and an inward thread lock are basic features found only in Speed Nuts. The ingenious design that sets up these two forces accomplishes more than you'd realize unless you checked into it more closely.

Spring steel Speed Nuts have a base which is well arched, and arched prongs that are formed to follow the helical pitch of standard screw threads. As the screw is tightened, the arch is reduced, forcing the prongs deeper into the root of the screw threads. This provides a double spring-tension lock that prevents vibration loosening.

Speed Nuts eliminate the use of lock washers and are 50% to 75% lighter in weight than other self-locking nuts. They are faster to apply and drastically reduce assembly costs. Double your use of Speed Nuts and you will double your assembly savings. Write for literature.

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The lightest weight self-locking nuts ever produced!

HOW YOU CAN USE YOUR POST-WAR PLANE

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Up in the woods where the big ones are biting . . . down on the shore where the tang of the sea fills the air . . . wherever it may be, you'll *fly* to your favorite vacation spot after the war is won. Your own personal plane will take you there, easily, economically, in a fraction of the time required now.

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Franklin
FINE AIRCRAFT ENGINES

AIRCOOLED MOTORS CORP.
SYRACUSE 8, NEW YORK

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YOU'RE LOOKING at the leading edge of an airplane wing a split second after the De-Icers were turned on. A sheet of ice that had formed was cracked by the pulsating action of tubes inside the rubber De-Icer "boot." In another second, it will vanish in the windstream. When more ice forms, the De-Icer tubes will pulsate again, crack it up . . . and off! The plane will continue safely to its destination!

In addition to guarding wings, B. F. Goodrich De-Icers crack ice off fins and stabilizers and all protruding accessories such as pitot masts and loop housings. They represent only a fractional percentage of a commercial plane's gross weight, and considering the protection offered for plane and crew, this slight added weight is negligible.

Introduced in 1930, B. F. Goodrich De-Icers have proved the best ice-elimination device ever developed for aircraft. For years they have been the standard ice protection equipment on the airlines. And today, in addition to serving commercial aviation, De-Icers are helping to bring Army and Navy bombers, cargo planes and transports safely through some of the worst icing conditions in the world.

De-Icers are an outstanding example of a B. F. Goodrich development in rubber. They have already saved the lives of countless airmen and will save countless more in both our military and domestic operations. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

Skyway or Highway

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FIRST IN RUBBER

Service Record..

The first Beechcraft built for the U. S. Army Air Forces was delivered and accepted on June 13, 1939.

Since that day, thousands of Beechcrafts have been accepted by both the Army and the Navy. Since that day, Beechcrafts have flown millions of hours for our armed services. Beechcraft advanced twin-engine trainers have schooled a majority of Air Forces bombardiers, navigators, and multi-engine pilots. Beechcraft twin-engine and single engine transports have safely and swiftly carried important personages on war missions, in this country and in foreign theaters of war. Beechcrafts have successfully operated from all sorts of runways in every conceivable type of climate, in all kinds of weather.

In more than a thousand days and nights of strenuous service, the stamina and performance of Beechcrafts have been severely tested. After five years of war and preparation for war, they have made such an outstanding record that today the Army and the Navy are *continuing* to order more Beechcrafts for training and other vital purposes.

Official Photograph U. S. Army Air Forces

Beech Aircraft

CORPORATION

BEECHCRAFTS ARE DOING THEIR PART *WICHITA, KANSAS, U. S. A.*

INVASION BY AIR

An earlier U. S. air invasion, against Japs in Markham Valley. This was a French D-Day pattern.

☆

A vast airborne army led the invading troops while 11,000 aircraft based on England backed them up.

☆

INVASION of fortified enemy territory by air is no longer theory. As Allied invasion forces advance in France, turning beachheads into whole conquered areas, sharply-defined, fundamental principles of air power have become clear. These principles not only will govern all remaining land operations in this war, they will go down in military history to be taught wherever military strategy is taught.

The Allied invasion into France has shown many things:

Invasions can be launched and supplied entirely by air. Several hours before Allied naval forces began to put men and equipment ashore on the French beaches, Allied air forces totaling thousands of bombers, fighters, transports and gliders were conducting their own full-scale invasion. Winston Churchill announced that a total of 11,000 military aircraft were on hand for the initial operations, although that number was not actually used.

The airplane has proved to be one of the most versatile pieces of military equipment known. From the moment they launched the invasion, heavy bombers bombed, strafed, towed gliders, dropped certain urgently-needed supplies. Fighters flew escort, photographed, dive-bombed, skip-bombed, strafed, spotted gunfire for naval vessels, laid smoke screens and, incidentally, shot down the few challenging German aircraft that showed up. The ubiquitous transports carried paratroops, airborne troops, towed gliders, dropped supplies, flew in heavy machinery and armament, rushed invasion-directing staff officers everywhere, even up to the front lines; flew wounded back to immediate medical treatment in England. Even the gliders were making aviation history, carrying troops, supplies, jeeps, guns and ammunition.

Equally as important as the versatility of an air force is its flexibility. This, too, was clearly shown from the beginning of invasion operations. When called upon,

the air forces launched and supplied their own offensive against the enemy. Nothing escaped the advancing air forces. Medium and light bombers and fighters smashed bridges, communications centers, motor convoys, railway trains, radio stations. By the second day of the invasion, for instance, only one railroad bridge and five highway bridges between Paris and Le Havre were intact. All the railroad bridges and all but two of the highway bridges across the Seine River, between Paris and Rouen, had been smashed.

All such offensive operations, meanwhile, were being supplied entirely by air. The landing of surface forces, of course, greatly expanded these operations. Once the ground forces were firmly established, large portions of the Allied Expeditionary Air Force switched to ground support operations, while the remaining air force units continued offensive operations.

Whether or not the Normandy coast landings were the main Allied invasion effort, the pattern that they emphasized applies equally to any other invasion, and might be briefed as follows:

1. Shortly after 1 a.m.—about six hours before assault troops landed from boats—hundreds of *Skytrains* (converted DC-3's), operating with and without glider trains, moved thousands of airborne troops behind enemy lines to seize bridgeheads, destroy communications and disrupt German defenses.

2. Battleships, cruisers, destroyers and rocket-gun vessels, supported by planes, blasted virtually every inch of the beachhead shoreline.

3. Rangers and assault troops landed on shore and battled their way through first-line defenses.

4. Hundreds of British and American fighter planes criss-crossed the skies in the beachhead area to prevent German aircraft from interfering.

5. Far beyond the beachhead, the medium bombers blasted key bridges, railroad depots and oil dumps to disrupt the flow of enemy reinforcements into the battle area.

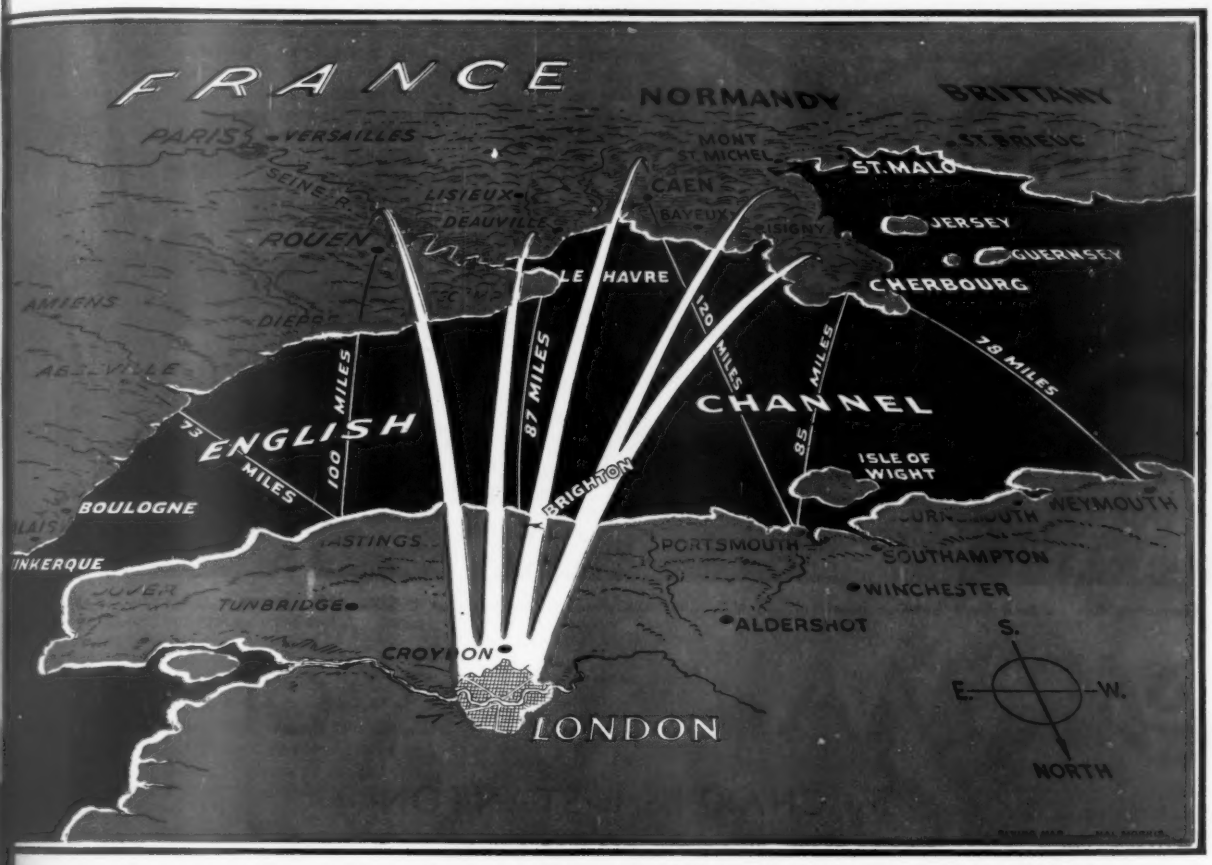
The main Allied plan of battle in the Cherbourg Peninsula seemed apparent before the first week of fighting was over. An unbroken chain of Allied beachheads had been established over a distance of more than 60 miles. On the eastern end of this chain British and Canadian troops were attacking Caen but their main purpose seemed primarily a holding maneuver to permit the American troops farther west to cut across the peninsula and to take the great port of Cherbourg at the tip of the peninsula. Cherbourg was vital as a port and base to move in the heavy equipment which could not be landed on the treacherous beaches, and to provide a steady flow of materiél unimpeded by the difficulties of the beach landings.

If this indeed were the plan of battle, it was ideally fitted for the flexible support of airpower. German reinforcements had to funnel down roads heading toward the peninsula and were under constant aerial attack. Allied airborne troops were landed athwart numerous roads to hold up German support—notably along the coastal road south of the peninsula and across roads from the east and north.

The composition of the Allied Expeditionary Air Force offers an interesting example of British-American co-operation in the invasion. The entire A.E.A.F. is under the command of Air Chief Marshal Sir Trafford L. Leigh-Mallory. The A.E.A.F. is made up of the American Ninth U. S. Army Air Force, commanded by Maj. Gen. Lewis H. Brereton; the British Second Tactical Air Force, commanded by Air Marshal Sir Arthur Coningham; and the Air Defense of Great Britain, commanded by Air Marshal Sir Roderick Hill. The A.E.A.F. is the actual invasion air force. Backing it up with strategic operations, meanwhile, are the U. S. Eighth Air Force and the various units of the RAF. To these latter organizations goes much of the credit for the weakness of the German air force on D-Day. To both the strategic and tactical air forces went credit for the fact that gun installations along the invasion coasts were all but knocked out by the time the actual invasion started. Consequently, losses of men

Douglas Skytrain troop transports and tow planes and the gliders they towed to France, on an English field a few days before D-Day. Huge gliders at far left are British Airspeed Horsas. U. S. gliders are Waco CG-4A's

SCENE OF INITIAL ALLIED INVASION THRUST



Aiming at a foothold in France and the fine port of Cherbourg, the Allies chose the Cherbourg Peninsula for their first thrust.

and equipment were far lower than anticipated.

One of the most amazing aspects of the invasion has been the negligible performance of the German air force. The Allied air forces have outnumbered the Luftwaffe 200 to 1; they continue to maintain that superiority as this issue goes to press. It was estimated that the Germans had 1,750 fighters and 500 bombers on hand to meet the invasion, although only a small fraction of that number has been seen to this writing. That total offers sharp contrast to Mr. Churchill's figure of 11,000 Allied aircraft available for the invasion operations. British sources also announced that, during D-Day operations, at least 31,000 Allied airmen were in the air over France. An unofficial estimate was that 65,000 Allied airmen participated in the first 24 hours of the invasion.

Though the Allied troops landed on the Normandy Coast on June 6, strictly speaking the invasion has been under way for months—by air. The strategic objectives of the British and American air forces have been to destroy and disrupt German industry, and the German aircraft industry in particular, by large scale bombing. The secondary effect has been to destroy huge numbers of German aircraft in combat.

In this phase of bombing the German industrial heartland the Army Air Forces flew more than a quarter million bombing sorties and dropped more than 200,000 tons of bombs between January 1 and May 15, 1944. Here are the statistics by months:

	Number of Sorties	Bomb Tonnage
January	44,175	33,112
February	44,993	34,141
March	56,608	44,022
April	73,101	63,444
May 1-15	44,743	40,644
Total	263,620	215,363

In desperate efforts to protect their industry, the Germans now hoarded their planes, now sent them into battle. The net result was a fearful and steady attrition of the Luftwaffe which can be told statistically speaking as follows:

	Nazi Plane Losses in Combat	U. S. Plane Losses in Combat
January	1,115	324
February	1,095	445
March	1,044	489
April	1,515	600
May 1-15	498	253
Total	5,267	2,111

As D-Day approached, the Allied bombers turned their attention from German industry to German communications. The crescendo of bombing moved closer to the coast as it was directed from the factories to railroads, highways and bridges. Bombers feinted to throw the defending Germans off-guard but the total effect was to isolate the battlefield before it became a battlefield.

In the 21 days before D-Day, more than 50 German airfields within 130 miles of Caen were bombed and 10 key coastal batteries were crippled. A total of 99 other important communication points in the battle area was also struck. Thirty minutes before the landings, 1,300 heavy bombers dropped an average of 530 tons of bombs on each brigade front. Also during the landings, seven squadrons of fighter planes protected each beachhead and five additional squadrons protected the convoys.

Summing up, it was estimated that a minimum of 77,500 tons of bombs would be needed to take out the key airfields, railheads, coastal defenses, and other targets before D-Day. Actually, more than twice that tonnage was dropped—166,940 tons. The German counter effort was an estimated 66 per cent short of what had been anticipated.

Allied air losses during the first two days of the invasion were 289 planes of all types (about one per cent). German plane losses for the same period were 176. The great majority of Allied losses were

(*Continued on page* 76)

Reenacting first air mail flight between Montreal and U.S., pilot hands mail to Secretary of Commerce Jones. The author is at right.

AIR MAIL COMES OF AGE

By CHARLES I. STANTON
Administrator, Civil Aeronautics Administration

It now is time for air mail to pay its own way, says the author.

In contrast to top scene, the Mars recently carried 25,000 pounds of air mail from Hawaii to California.

IN THE early days of contract air mail service, overzealous contractors were alleged to have kept their revenues up by airmailing themselves metropolitan telephone books and neatly-packaged bricks. The contractor thus would be able to pocket the difference between the cost of the postage on the bricks and books and the price he was paid for hauling them.

I am not at this time discussing either the ethics or the economics of such practices, although, of course, both could be questioned and found wanting. Whether it had its dubious role in forwarding the cause of air mail is a history-book debate. At present, aviation's interest is not in the past. It is in the present and future. But in approaching the problems facing us it would seem wise to recognize that the days of uneconomic and sometimes humorously absurd transport operations are gone forever. Air mail has come of age.

I think, further, that I voice the opinion of both the aviation industry and of the Civil Aeronautics Administration that we want to keep air transport service at its highest efficiency toward winning the war despite handicaps, and that, in the post-war era, we want to develop and expand air mail and air transport generally to its maximum limits.

The debate comes in determining the "maximum limits." Opinion in the industry and among the general public on this subject varies so widely that it is difficult to get a point of departure for discussion.

It is my studied opinion, in estimating these limits, that we should be guided by three concepts:

1. Air mail should, in the future as in the present, pay its own way.

2. New domestic services should be developed wherever they are patently needed.

3. Foreign *air mail* service should be subsidized only where the specific situation makes a subsidy seem a wise promotional venture in improving trade or foreign relations. And the subsidy should be given for what it is, and where it is needed—not hidden in a surcharge on all foreign mail and passenger service.

The case for domestic air mail paying its way is a matter of pure statistics behind which lie one of the most dramatic stories of co-operation between Federal and private enterprise in modern history. Twenty-six years ago this past May, air mail operations began. By June 30, 1918, 16,009 revenue miles had been flown at an average cost of 85 cents per mile. For the first full fiscal year of operation, ended June 30, 1919, 160,066 revenue miles were flown, at an average cost of $4.48 per mile. This was the highest cost in the history of the air mail. From then on the trend has been steadily downward, reaching a cost-per-mile of 26.4 cents for the year ended June 30, 1943.

Balance sheets for these pioneer and promotion years had two things in common. Almost without a break the number of revenue miles increased steadily; and the final figure on the dollar side of the ledger was invariably in bright red.

Both of these facts give emphasis to the co-operative effort that made U. S. air mail and air transport the world-leading enterprise that it is today. Private enterprise consistently and steadily forged ahead in designing and efficiently operating transport planes. The Federal Government consistently and steadily contributed millions of dollars for developing air mail and airways in keeping with a sound program of progress. Together, they created an enterprise which has not only paid off many fold in public services but has proved invaluable when we came to face the colossal problems brought on by global war.

Within the past two years there has been a significant change in the annual air mail reports. Revenue miles have continued to increase. But losses, which totaled $9,000,000 in 1940, declined to $3,000,000 for the year ended June 30, 1942. In the corresponding period for fiscal 1943—the first time in air mail history—they went into the black ink. Profits for fiscal 1943 were nearly $18,000,000 and by June, 1944, were estimated at more than $31,000,000 for fiscal 1944.

While the Post Office Department was thus making fiscal history, the airlines and airways were writing a glowing chapter in the history of transport operations. During the calendar year 1939, more than eight and one-half million ton-miles of air mail were flown. This increased to more than 10 million in 1940, to more than 21 million in 1942, and to more than 37 million ton-miles in 1943. More than 40 million ton-miles are estimated for the fiscal year ended June 30, 1944. And this in spite of the fact that, since the war began, domestic air mail has been flown by about half as many planes as were used to do the job before Pearl Harbor.

So far as the future is concerned, the most significant fact is that domestic air mail is more than paying its way. The days of expensive experimenting are past, gone is the need for promotional subsidies which aggravate balance-sheet losses. Domestic air mail and domestic air transport are going concerns.

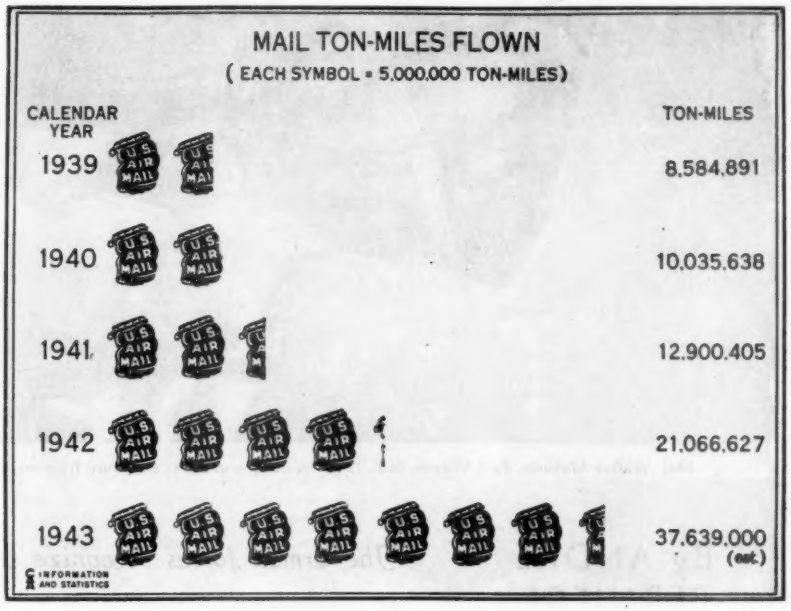
This does not mean that sound development and expansion, even with Government aid when necessary, should stop. It should continue until the advantages of air transport have been made available wherever public convenience and necessity require. It has always been considered sound business practice to plow back at least a percentage of the profits into an enterprise and there seems no reason why this should not apply to the Government's interest in air mail and, in the not distant future, air parcel post. But I believe that the best interests of aviation will be served, generally speaking, by healthy growth weaned from subsidy.

Mail follows trade. The same thing has been true of air mail. It would seem fair to assume that this trend will continue, and it is a trend which will call for more schedules and larger aircraft.

There will, of course, be exceptions. Conceivably, air mail and air parcel post will have so many advantages over other forms in certain areas that pick-up, small-field, and even helicopter service will be in order, even though they have to operate initially with a subsidy. But such subsidies should be promotional in nature—aimed toward the day when the service in question can join the over-all transport system and become self-sustaining.

They should not be used in the face of facts showing that another form of transportation can do the job equally well at less cost. Such a program would result in the supply of service exceeding the demand and, conceivably, could lead us back toward the alleged book-and-brick practices of the pioneering era. Nor must

(*Continued on page* 150)



Air mail volumes have more than quadrupled during the past four years.

The ACE BUSINESS

Maj. Walker Mahurin, Fort Wayne, Ind., receives congratulations on return from mission in which he shot down three planes.

By ANDRÉ BERNIERE

The armed forces recognize but cannot avoid the evils of publicizing aces in a war where only teamwork wins.

THE air ace business is booming.

In recent months, headlines have sung the praises of the Fosses, the Boyingtons, Gentiles, Bongs and Johnsons. And, when Capt. Don Gentile, Maj. Richard I. Bong and Capt. Robert Johnson eclipsed Capt. Eddie Rickenbacker's World War I record of 26 enemy planes destroyed, the headlines got fatter and the stories longer—with some newspapers and press services carrying life stories of the heroes in serial form.

It made good reading, but some military authorities — and especially the aces — were none too happy about it all.

Without disparaging the accomplishments of these heroes of the sky, they were somewhat apprehensive about the effect this lionizing of individual airmen would have on the one thing the American and Allied air forces stress above all —teamwork. Perhaps none realize this more than the heroes themselves. All are aware that what catapults them to fame

NAVY

Left to right: Lieut. Comdr. Edward H. O'Hare, Lieut. Comdr. John S. Thach, Lieut. Stanley W. Vejtasa, Lieut. (j.g.) Ira C. Kepford, Lieut. Comdr. Dewitt W. Shumway, Lieut. (j.g.) Hamilton McWhorter These are some of the Navy's aces.

ARMY

Left to right: Maj. Richard I. Bong, Poplar, Wis.; Capt. Robert S. Johnson, Lawton, Okla.; Capt. Don Gentile, Piqua, O.; and Capt. John T. Godfrey, Woonsocket, R. I., Gentile's wingman. These four pilots have destroyed 100 enemy planes.

is something more than heroics. Basically, it's teamwork—the aid of unpublicized wingmen and ground crews, superior planes, better training, and a bit of luck thrown in.

All the boys with high scores sing the same tune:

"We're not interested in individual box-scores. We're all one team and we're chiefly interested in destroying as many Germans and Japs as fast as we can so we can get this thing over with sooner. We're not out to make individual records. Don't forget the great job our wingmen and ground crews do. We get all the glory, but they deserve a lot of credit because they provide the protection and help set up the enemy for the kill."

What Bong said on his return to Washington after knocking down his 27th Jap typifies the attitude of these aces:

"The boys you want to give credit to for helping get the war over are the ground crews. They work day and night keeping our planes in flying condition. Then they sit behind and sweat us out on a mission and get us back. When we come in and they see we've dropped our belly tanks they know we've been in a fight. As soon as we land, they climb all over the wings yelling 'How many did ya get? How many did ya get?'"

Military authorities realize that publicizing an individual is a necessary evil. Americans have an insatiable appetite for headlines and news of heroes. That goes for air aces as well as home run kings. They want to read about the pilot who knocks down the most enemy planes. The pilot who goes out on long, monotonous and dangerous patrols is just as important as the man who bags 25 or 30 enemy planes, sometimes more so.

Witness the pilots who spotted the approach of the Japanese armada off Midway and sounded the alert which brought Japan its worst naval disaster. Yet these men got no headlines. The official Navy communique describing the Midway action did not even name them. It simply said:

"At about 9 a.m., June 3, U. S. Navy patrol planes reported a strong force of enemy ships about 700 miles off Midway, proceeding eastward."

By contrast, a Navy communique a few months earlier, describing the destruction of 16 of 18 Jap planes which sought unsuccessfully to sink the aircraft carrier *Lexington*, said:

"Lieut. (j.g.) Edward H. O'Hare, U.S.N. fighter pilot, personally accounted for six bombers of the enemy."

Sometimes generals, too, catch the hero-praising fever. When Gentile became high man among U. S. Army Air Forces pilots in the European theater, Gen. Dwight D. Eisenhower, supreme Allied commander in the European theater of operations, described him as "the one-man air force." And, when Bong brought down his 27th Jap to better Rickenbacker's mark, Gen Douglas MacArthur, supreme Allied commander in the Southwest Pacific, proclaimed him the American "ace of aces."

Air ace worship is not confined to Americans.

The Germans extol their aces. From time to time Radio Berlin has credited certain Luftwaffe pilots with as many as 100 kills—claims which are considered fantastic by most air experts who know the laws of probability and believe the German purpose is to buttress flagging morale at home.

And the British and Russians have their aces.

The RAF, for instance, has its Group Capt. A. G. Malan, who is credited with 32 kills. Then there was the late famed Brendan (Paddy) Finucane, who also had 32 kills before he perished. Others include Canadian Flight Lieut. George ("Screwball") Beurling, who bagged 31 enemy planes before he was grounded; Wing Comdr. Standford Tuck, who had 29 before he was forced to bail out over Germany; and Wing Comdrs. J. R. D. Braham and J. E. Johnson, each credited with 28.

The Russian ace of aces is Maj. Alexander Pokryshkin. He is top man among the Allies with the amazing total of 59

(*Continued on page* 110)

MARINE

Left to right: Lieut. Kenneth A. Walsh, Washington, D. C.; Maj. Gregory Boyington, Maj. Joseph J. Foss; and in group, Lieut. Robert M. Hanson, Newtonville, Mass.; Capt. Donald N. Aldrich, Chicago, and Capt. Harold L. Spears, Ironton, O.

MODEL AIRMEN

Fitting winter flying jacket on plastic manikin. These models determine proper construction of plane cockpits and ball turrets to accommodate various physiques.

THEY'LL never shoot down a Zero or Messerschmitt, but the plastic manikins and ladykins of the United States Army Air Forces are helping to win the war. With the aid of these transparent models, designers of aircraft and flight equipment are able to tailor their products to suit the physical specifications of the men and women who use them.

The idea for the plastic figures originated with the Aero Medical Research Laboratory at Wright Field, Dayton, O. This laboratory is a section of the United States Army Air Forces responsible for research in aircraft medicine. It also tests and makes recommendations for personnel equipment for almost every branch of the air force. One of the laboratory's notable contributions has been in the design of aircraft clothing and oxygen equipment.

For a long time, aircraft equipment designers were handicapped by the problem of getting live models who would represent the average physical types serving in the Army Air Forces. There are few men who have the exact physical measurements to match the average specifications of millions of AAF men. Furthermore, if such men were found they could not stand the strain of posing for hours, days or months needed to perfect equipment and test it.

Therefore, Col. O. O. Benson, then Chief of the Aero Medical Research Laboratory, Lieut. Col. W. Randolph Lovelace II, his successor, and Capt. F. E. Randall decided to get something better than a live model—an inanimate one that could be left indefinitely and twisted into any position taken by a man in a plane, an anatomical man made to the average dimensions of AAF cadets.

The first move was to determine what the average physical types in the AAF are. Dr. Ernest Hooton of Harvard University was engaged to obtain facial measurements of Air Corps cadets for the purpose of testing and designing such equipment as oxygen masks, goggles, helmets and accessory headgear. Under the direction of the Air Force representatives, a staff of anthropologists measured a sample group of several thousand cadets. After completing the data, the anthropologists divided the figures into seven basic types and the averages were tabulated.

When the tabulations were finished, the figures were turned over to G. W. Borkland, president of General Plastics Corporation and a sculptor in his leisure time. He interpreted the measurements in clay, making busts of the seven average types of men accurate to one millimeter.

Borkland first sketched the heads on paper. Then he modeled them full size in clay and made plaster-of-paris casts of

By GEORGE J. BERKOWITZ

Representing average men, models help in designing AAF clothing and equipment.

Wearing parachute, plastic manikin is fitted into trainer. Ordinarily the manikin is completely clothed. Leg room and position of ankle and foot are important here.

the busts to obtain a permanent standard which could be produced for the various agencies designing AAF equipment. The seven basic heads were ideal for use in studying, designing and testing helmets, goggles and radio headgear worn on the heads of flyers. They were reproduced and sent to Wright Field and, in turn, distributed to the various branches of the Air Forces, Army and Navy, and to those United Nations countries which could use the information to advantage. Such institutions as the United States Bureau of Mines, the Metropolitan Museum of Art in New York City, and the Canadian government also have copies of these heads.

Following the completion of this work, the Aero Medical Research Laboratory decided that life-size, articulated manikins made of light, durable materials could assist the design of seats, clothing and other personnel equipment. Captain Randall was assigned the task of obtaining the data from which the specifications for these articulated manikins could be determined.

Again, several thousand cadets were measured to ascertain the actual measurements of the flyers in the AAF. Besides height and weight, such measurements as the span akimbo, bi-acromial (a shoulder measurement) bi-deltoid (widest shoulder measurement), patella (knee-cap) height and bi-trochanteric (across hips) were all taken to millimeter accuracy.

There are three basic physical types of aviation personnel, named A, B and C, for convenience. Type A, the medium-sized "average" man weighs 154.3 pounds, is 5 ft. 9 in. tall with a chest circumference of 36.25 inches and a sitting height of 36.25 inches. Type B is the small man, 5 ft. 5½ in. tall and 140.3 pounds, chest circumference 34⅞ inches, sitting height 34⅞ inches. Type C, large, is 6 ft. 1½ inches and weighs 171.7 pounds. His chest circumference is 36⅝ inches, sitting height 38 inches.

This information was then given to Borkland, who undertook the job of making the plastic manikins. The problem was to make the manikins transparent so that clothing and equipment could be studied from all angles without the interference of an opaque material. They had to be full-sized, but light enough to carry easily; flexible, so the actual movements of a man flying a ship, operating a radio, bomber controls, or gun turrets could be interpreted; and perfectly balanced, so they could stand on their own feet.

Borkland drew each type of manikin on paper, full-size, from the specifications furnished him by the anthropologists. Then he modeled them in clay and made plaster casts of the figures to be used to make the molds.

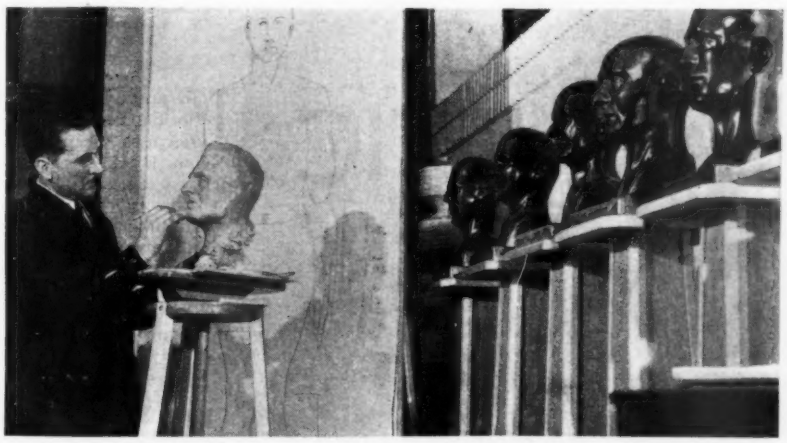
Before the molds could be completed it was necessary for Borkland to engineer all the joints to permit accurate motion of the figures. Extensive study was required to simulate human motions and still maintain the measurements of the subjects in various positions.

After the completion of the dies, the manikins were molded in sections from Fibestos (made by Monsanto Chemical Company) and Plastacele (manufactured by E. I. duPont de Nemours & Company). The seams joining the various sections were closed with a specially made cement.

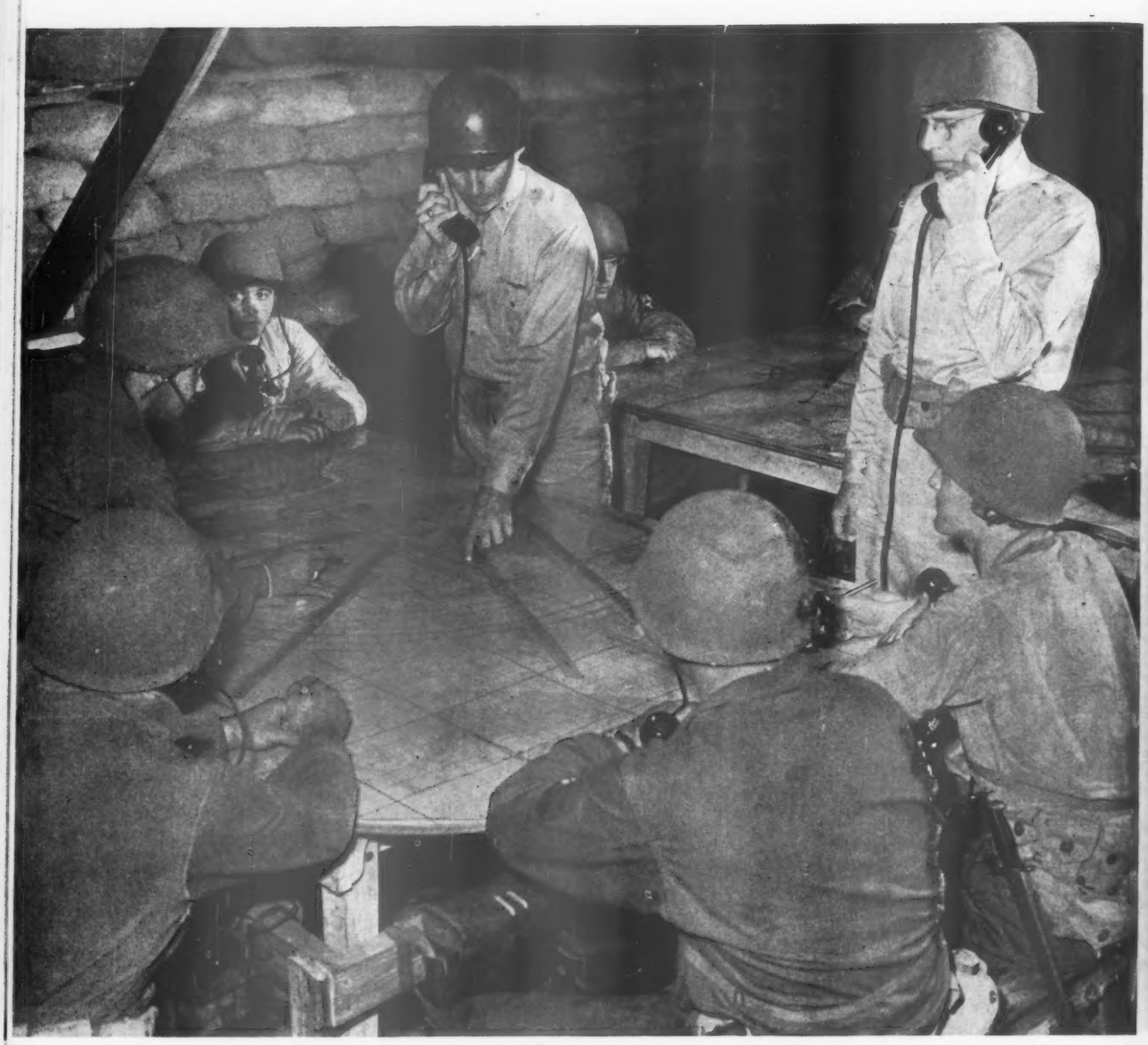
For flexibility, seven feet of thick rubber cable—stretched to 16 feet in length—was used to hook the parts of the manikins together. The elastic cord has a tension weak enough so that the limbs can be moved easily, yet strong enough so they will stay in place when set in a specific position.

Assembly of the manikins was a tricky job, requiring the co-operation of four

(*Continued on page* 158)



Sculptor G. W. Borkland, who made all models, works on head of Type C manikin. The five heads at right comprise part of series of seven basic types of head.



Control officers for fighters, searchlights and antiaircraft co-ordinate efforts in repelling night "attack" during maneuvers.

SYNTHETIC AIR WAR

By JOSEPH A. BORS

Washington War News Editor, International News Service

Before they enter combat, airmen are trained in simulated war on AAFTAC's battlefield.

THE groundwork for America's aerial victories is being laid in Florida, home of the Army Air Forces Tactical Center—better known as AAFTAC.

Gen. H. H. Arnold, chief of the Army Air Forces, recently described the tactical center as "the last dress rehearsal for air war.

"This organization constitutes one of the most important elements of the final training for our air and ground crews, and the testing of equipment which will be used overseas," Arnold added. "The men live, work and fight as they will abroad, in organizational units as large as a complete task force.

"Fighter, bomber and patrol missions are carried out from a dozen airdromes in an actual theater of operations about the size of Sicily. Instructors and advisers are experienced officers; many have just returned from combat."

AAFTAC is the springboard from which fully trained crews take off for the war fronts, and it is the proving ground of most of the tactics that have enabled American airmen to maintain a high ratio of victories over the enemy.

This writer was one of the few civilians fortunate enough to visit AAFTAC and to see how the Army Air Forces schools its men.

While pilots are briefed, ground crews load Havocs with 100-pound practice bombs. This plane is to be used in skip-bombing practice.

Much of the credit for developing AAFTAC must go to its commanding general, Brig. Gen. Hume Peabody. The striking arm of AAFTAC is the Demonstration Air Force organized to function as an air force in the field.

Component units of the organization are: the fighter wing, weather squadron, photographic air unit, troop carrier squadron, strategic air force and tactical air force. Here is an example of how this force would meet and destroy an enemy:

First, the deputy commander of operations obtains information from his combat intelligence chief concerning where the enemy intends to hit, possible weapons and tactics he may use, and data on where he may be weak or strong.

The deputy commander and his staff work from Orlando and must be in constant communication with all units of the force.

The fighter wing's job is to protect certain key positions. Through its air warning service it keeps track of all aircraft flying through the defended area.

If an "enemy" air raid shows on the control room boards, a controller dispatches fighter planes to intercept and destroy the airborne enemy. Night fighters or day fighters are called into play.

Bulls-eye! Skip-bombing tactics were developed at AAFTAC and later improved, following combat reports which showed planes needed more frontal firepower.

Other fighter squadrons accompany the bombers on simulated raids.

Thus the units assigned to AAFTAC function 24 hours per day on the same basis they expect to work in combat.

In order to train hundreds of control officers, filter and control room personnel, pilots, searchlight teams and night fighters, this area in central Florida is "attacked" constantly by planes masquerading as the enemy.

Meanwhile the weather squadron functions as a demonstration weather service to supply valuable data on conditions in the area affected.

The troop carrier squadron stationed at Dunnellon, Fla., moves paratroops and airborne engineers, participates in glider-towing, lands airborne troops, and plans the transportation of all personnel and cargo.

In the photographic aviation section flight and technical units gather and interpret all aerial photographs.

One interesting aspect of the never-ending air-war at AAFTAC is the co-ordination between the strategic and tactical air forces.

Primarily, the strategic air force destroys the enemy's industry and breaks down his civilian morale with bombing attacks deep behind enemy lines. Crews trained at AAFTAC are regularly carrying out such missions in war theaters today.

On the other hand, the tactical air force smashes the foe's communication lines, supply lines and forward bases and makes every attempt to isolate his battle area.

One of the major duties of combat-wise officers at AAFTAC is to develop new tactics, techniques and procedures to be used by air forces already abroad, and to out-think the enemy by improving offensive moves to counter-balance any defensive innovations perfected by the enemy.

Importance of this work was best expressed by General Arnold, who said:

"The standardization of technique of operations and employment of planes is not possible in this global war, for 90 times out of 100 an idea that succeeds in Italy will not work out in New Guinea. Hence we must be versatile—our tactics must be susceptible to change—our commanding officers must have ingenuity and imagination."

One of the best examples of the way AAFTAC helps win victories thousands of miles away was the smashing victory of Lieut. Gen. George C. Kenny's Southwest Pacific air force in the Bismarck sea.

The world was told at the time that Kenny's airmen used revolutionary "skip-bombing" tactics to wipe out an entire Jap convoy of 22 warships and supply vessels. In the action Kenny lost three planes, while the Japs, in addition to the ships, lost an estimated 55 planes and at least 15,000 men.

Not generally known at the time was that airmen at AAFTAC spent weeks in Florida working out the refinements of skip bombing before it was unleashed with such devastating effect against the Japanese.

When Kenny reported that his bombers had destroyed every ship in the convoy, even the officers who developed the technique were amazed, and a little puzzled. They had not hoped for an almost perfect

(*Continued on page* 134)

Simulating air-sea rescue, men are taken out into the Atlantic and planes dispatched to find them and radio their position.

AIR POLICY AND THE STATE DEPARTMENT

The State Department denies making any "secret deals," declares that American international air policy must be aimed at the main objective of all our foreign policy—a system of permanent peace.

Assistant Secretary of State A. A. Berle heads air delegation.

THE United States State Department's position on post-war international air commerce is based upon the major consideration toward which all American foreign policy is directed—the objective of a system of permanent peace. As such, say State Department sources, it is neither confusing nor contradictory—as has been implied on occasion by some commentators.

Sources in the State Department close to A. A. Berle, Jr., assistant secretary of state, who heads a group of State Department experts in charge of air problems, have helped a FLYING representative clarify the department's position on post-war international air commerce and the status of international air commerce negotiations.

From the outset of the war, the United States Government has maintained continually and forcefully that a system of permanent peace must be accomplished through arrangements of general international co-operation. On this basis, international exchanges have gone forward toward holding a United Nations Aviation Conference. Bilateral conversations have been completed or are nearing completion with the British, the Soviet Union, the Chinese, the Canadians, the commonwealth countries and those South American countries which are chiefly interested.

State Department officials point out that it was impossible to predict how soon these preliminary conversations would be ended. Understandably, work has to crystallize to a point before a delegation to represent the United States can be chosen. Prior to that point, it seemed fitting to use advisors or negotiators only. Such is the technique of international courtesy and it is grounded on practical considerations.

The State Department emphasizes that no mysterious or secret deals have been made during these preliminary conversations, nor will any be made at the big conference. Under the rules of international courtesy, details on the state of negotiations for the latter cannot be released until they are completed. But in the meantime, qualified U. S. officials and civilian aviation leaders are fully informed as to what is going on.

When the exchanges began last December, the State Department commenced a series of consultations with the United States Senate. The department consulted with the sub-committee of the Senate Committee on Commerce, headed by Sen. Bennett Champ Clark of Missouri, and later with the Senate Committee on Foreign Affairs.

From the beginning, the State Department had an understanding by which, as matters progressed, they kept these officials generally informed. They have endeavored to indicate the various turns of the discussions as they progressed. In return, the State Department has received, not a green light, but a general statement from Capitol Hill that its representatives are in agreement with State's point of view.

It is the State Department's intention to continue this procedure.

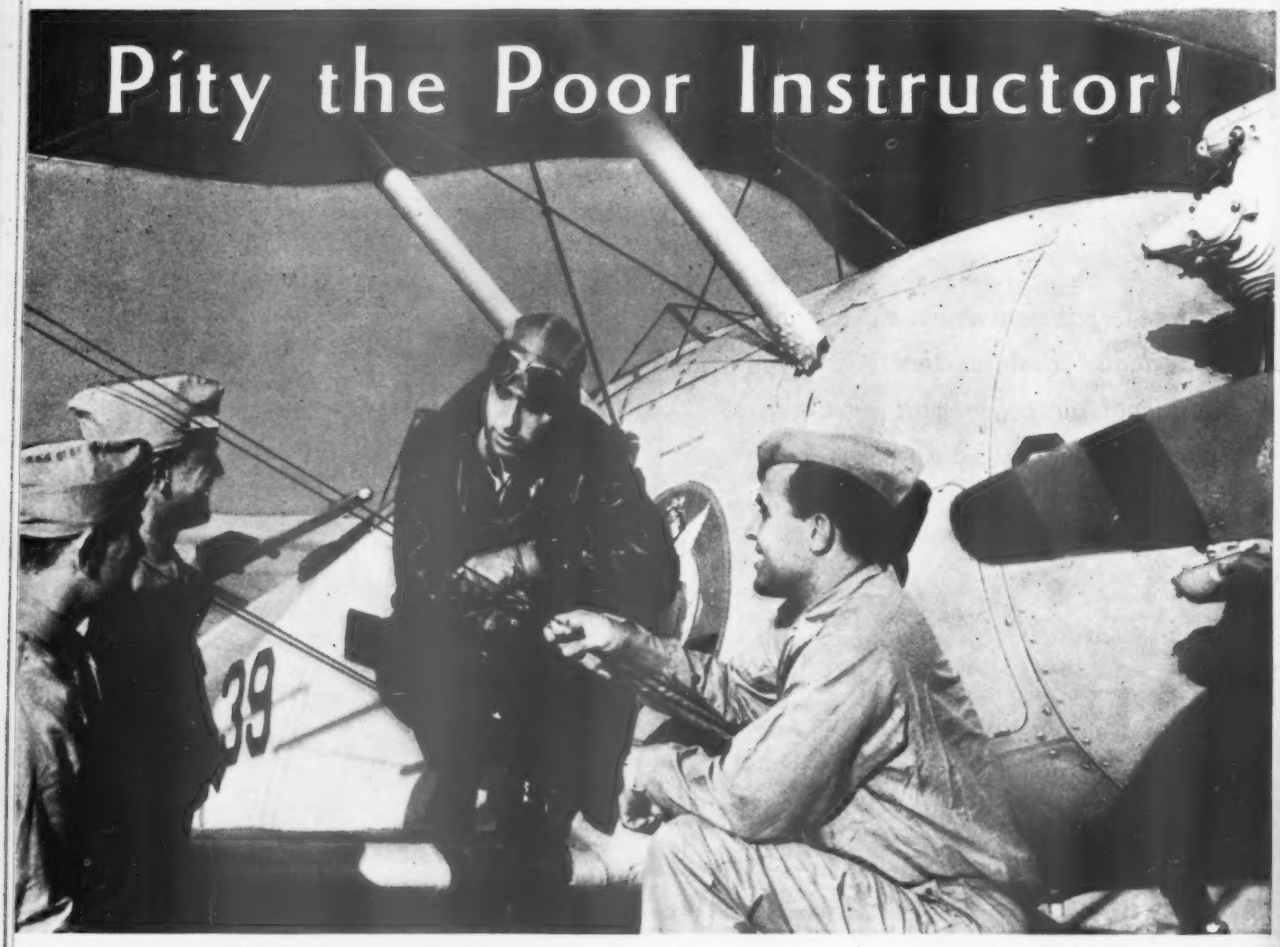
While it was not clear whether commercial airlines should be drawn into discussions as advisors or otherwise, the policy of the State Department from the beginning has been to keep in close touch with domestic airlines and get the benefit of their views on all matters relating to their interests. A State Department spokesman added that this aspect of the work has not been helped by the differences among the airlines themselves.

It is emphasized that the bilateral exchanges have been concerned only with arrangements for the United Nations Conference. No actual conference has been held, no conclusions reached. What form the big gathering should take—where it is to be held and when, and who should be represented — cannot be predicted. These questions must wait until the bilateral exchanges reach a point where it seems practicable for a general conference to be called. State Department representatives realize that the problem is not simple.

In the words of Assistant Secretary Berle: "Everyone knows that world forces are shifting; few save technicians realize the depth and scope of the impending shifts. Occasionally, we are privileged

(*Continued on page* 156)

Pity the Poor Instructor!



Naval instructor and fledglings. The author believes that theories and planes change but students remain the same.

By Lieut. Col.
H. S. MAZET, USMC

The old instructor finds that only he has changed with time; his students are as unpredictable as ever.

RECENTLY I was ordered away from duty at a primary flight training airdrome. Thus ended my long association with cadets, an instruction experience for which I would take no amount of money. It was a long term of service. It took me several months at the great U. S. Navy flight school at Pensacola to learn what instructing was all about; two years later while instructing for the Army I began to feel that I understood the fundamentals.

Now, after a period of instructing advanced CAA pilots and two more years with the Navy, I am convinced that I know practically nothing about the art of instructing students in the air and rather less than that about the theory involved. There is something insidious about teaching cadets to fly and the longer a pilot remains in the work the more helpless he feels when younger instructors come to him for advice. After a couple of years and innumerable classes of cadets an instructor becomes either (a) cranky and scornful or (b) very tolerant. At least, during working hours.

Changes in techniques, in theories, in training programs, in syllabi and in primary planes are inevitable. But students remain fundamentally the same. The youth at the dual controls in Texas is quite like the young chap who used to sit back of me over California terrain endeavoring to master the manipulations required for snap rolls. The cadet who just last winter failed to pull back the stick enough to prevent a bad bounce on landing is the counterpart of lads who flew with me in a similar capacity in Florida years ago.

Only I have changed, grown grayer, perhaps a bit more cautious and, I think, more tolerant. At least, the longer I fly the less I am convinced I know about it. Of course the mere taking off, the flying and the landing are almost second nature; nothing puzzling about that. But the problem of how to impart all these thousands of hours of experience through speaking tube and dual controls is still as baffling as it was when first I went aloft with an anxious fledgling in the other cockpit conscious only of eyes, ears and finger tips.

It was some time before I became aware that classes are fundamentally alike, that faces and names differ but the student underneath is still the same old student, anxious, full of enthusiasm, doubts and fears—with the exception of the very few who are "born flyers" and who take to the air like veterans. It is inescapable that one or two "sweet" potential pilots exist in every class and the instructor who has one feels just plain lucky.

Now, from the perspective of six months, I realize the one inevitable conclusion that will sooner or later be forced through the shell of the most

(*Continued on page* 138)

TRAINING OCTET
24
27
22

FORTRESS FLATTENED FACTORY

2107457
SKYMASTER

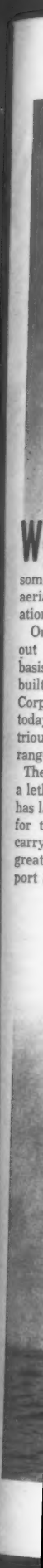
RUGGED BEAUTY

MARYLAND OVER ITALY

BULL SESSION

"YOUR'E COMING IN HIGH..."

CORONADO



CONVERTING *the Coronado*

By HAROLD KEEN

Aviation Editor, San Diego Tribune-Sun

Most of the giant Consolidated PB2Y's, originally built as long-range bombers, are now being converted to cargo use.

WHEN the bulky, four-engined experimental prototype flyingboat splashed into the waters of San Diego Bay some years ago, it was acclaimed as an aerial battleship, the most formidable aviation weapon in the U. S. arsenal.

One of the largest aircraft ever turned out on a mass production assembly line basis in this country (hundreds were built at the Consolidated Vultee Aircraft Corp. plant in San Diego), the *Coronado* today is overshadowed by its more illustrious brother, the *Liberator*, as a long-range bomber.

The big-bellied flyingboat, once touted as a lethal puncher of unprecedented might, has largely forsaken the glamour of battle for the essential role of cargo plane to carry critically needed war materials over great distances. The Naval Air Transport Service today is relying on a fleet of these winged leviathans for carriers with the cargo space, speed, endurance and fuel capacity to meet the demands of global assignments.

Scores of *Coronados* have been called in from purely combat jobs for conversion to transport craft, a major transformation exemplified by the tremendous operation at a new flyingboat repair base established at Rohr Aircraft Corp., Chula Vista, Calif. On a broad acreage which once was pasture land along the shores of San Diego Bay, *Coronados* are being dismantled, their insides ripped out, and planes specifically fitted for the twin tasks of carrying important personnel and vital cargo are re-born.

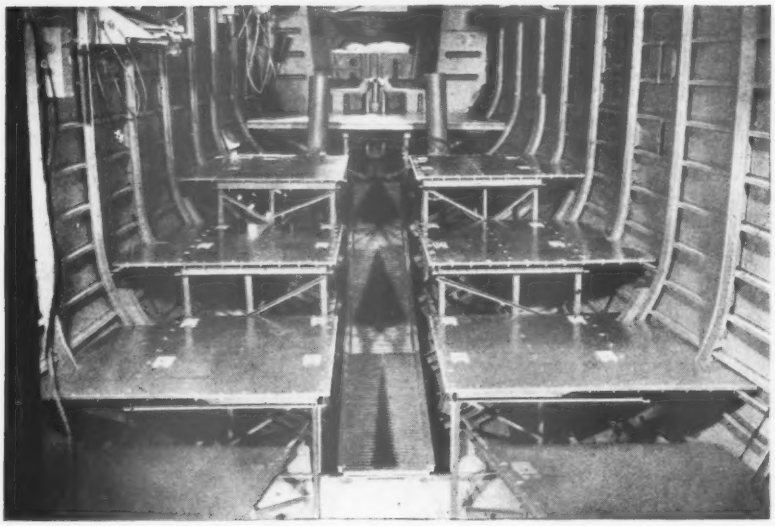
The scale of the project can be realized by a Navy-approved examination of the *Coronado's* dimensions. Its 115-foot wing span is one of the greatest of any quantity-manufactured plane in the United States. It has an overall length of 79 ft. 3 in. and a height of 27 ft. 6 in. Its empty weight is 37,500 pounds. Loaded, the *Coronado* packs a 34-ton bulk. The massive wing with its four engines weighs 22,500 pounds, more than three times the total weight of a Curtiss *Warhawk*. The tail assembly's span of 38 ft. 1¼ in. is wider than the whole wing of the Bell *Airacobra*. The number of parts, including rivets, bolts and nuts, that go into this plane total almost 700,000.

Its range, fully loaded, is nearly 3,000 miles. It can travel faster than 200 m.p.h.

When a *Coronado* is hauled up the concrete ramp to the Rohr flyingboat base, it is about to receive a major operation.

First step is to make a "clear gas run" to clean the highly corrosive 100-octane fuel out of the 1,200-h.p. Pratt & Whitney

The converted Coronado is now able to carry 44 passengers, or 24 passengers and an 8,600-pound cargo load.



Converted Coronado tail space can be used either for passengers or cargo. Removable passenger seats are fastened to these light metal platforms.

Tail space shown at left but with passenger seats installed.

engines. Seventy-three octane gasoline is run through the power plants at 1,000 r.p.m. for one-half hour; the engines are coated with a preservative oil and sent to the Navy for storage.

Tedious work is the re-routing of surface control cables, which in the military version occupy the center of the plane's interior, restricting storage height. These cables are placed in the ceiling, leaving the main cargo compartment clear of obstruction.

The corrugated dural decking is replaced by a smooth dural and wood deck, with hundreds of cargo tie-down rings installed in the floor and sides to avoid damage to delicate material in transit. Hoisting eyes are placed inside and outside the craft to expedite loading and unloading, and a large cargo hatch frames the old small entrance door in the fuselage beneath the wing.

Performance at average altitudes is enhanced by replacing the *Coronado* power plant assemblies and oil tanks with modified *Catalina* engines, smaller in diameter and with a decrease of 15 to 20 inches in extension from the wing. The supercharger is eliminated, further saving weight. New engines are on the converted *Coronados* before they go into service as cargo planes.

Propellers on the inboard engines are four-bladed, while those on the outboard engines are three-bladed. The metal gasoline tanks are sealed against leaks caused by vibration. Outer wing panels must be "beefed up" to carry larger pontoons.

On the C deck over the crew's quarters, formerly used as a storage space for life rafts and a step-up for the navigator en route to the astrodome in the top of the *Coronado*, are installed the galley, originally a part of the main cargo compartment, the auxiliary power unit, rear cabin heater, and the emergency water-still.

Below the flight deck is the forward sleeping compartment, sound-proofed for comfort on long flights. Bunks can be let down during the day, forming seats with a back rest and increasing passenger capacity.

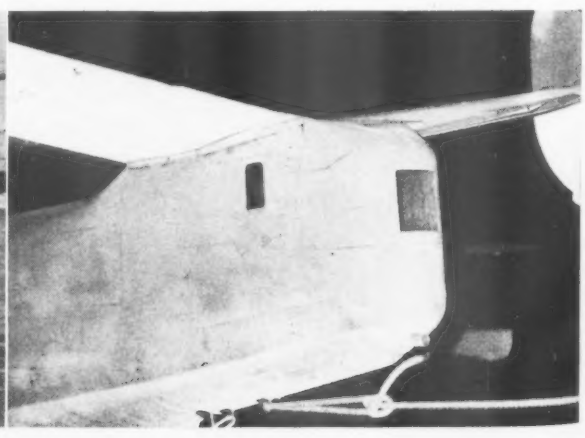
To make room for extra cargo, seats can be easily removed.

Without cargo, the *Coronado* has a capacity of 44 passengers, including a crew of five. Twenty-four passengers can be carried with 8,600 pounds of cargo, and on a 1,000-mile trip without passengers, 16,000 pounds of material can be delivered. These are figures of significance to America's post-war transoceanic aerial merchant marine, especially when it is considered that large numbers of such seaplanes, ready for immediate adaptation to commercial usage, will presumably be available after victory.

Not all the *Coronados* arriving at Rohr's plant—only a few miles down the bay from their "birthplace" at Consolidated Vultee—are combat planes back from the war. When the Navy's policy to convert many for its air transport service was adopted, a substantial number was sent directly to the seaplane repair base from the end of Convair's assembly line, minus power plants and with interior bare.

(*Continued on page* 156)

Bomber version of the Coronado has a formidable tail turret to protect it against fighter attack.



The modified Coronado's tail has no turret. The space is used for carrying cargo or passengers.

Regulations

With or without provocation any airline representative or any private pilot will tell you that there are too many regulations. To a recent Civil Aeronautics Board query to private pilots, the response was practically unanimous—regulations should be reduced. . . Top CAB officials reply to airline critics that regulations in that field should and will be reduced, but that it is going to be difficult since nearly all regulations were entered only after airline officials okayed them, usually after requesting them. To the private flier, Civil Aeronautics Administration leaders say that regulations can and will be reduced, but again the process is going to be gradual rather than drastic and spectacular—safety comes first. . . . Getting down to cases, the recent airlines' move to change regulations so as to increase gross loads on transport aircraft is typical. Hearings on the proposal were lengthy—Dave Behncke, for instance, testified more than 100 pages on behalf of the pilots—and after the music went 'round and 'round it came out right where it had begun—increased loads were disallowed.

The Wheels Grind Slowly

Airline and CAA-CAB officials agree that the hearings will make regulation modification more difficult. Airlines would avoid modification by giving airline officials a free hand to do their own policing. They point out that their regulations are more stringent than those laid down by CAB—check-ups by Government inspectors are wasteful duplication. . . . On the lightplane side, the Board quotes C. Earl Steele, president of the Professional Flight Instructors Association, with headquarters in Los Angeles. "Public meetings on . . . proposed revisions," he says, "should be held in every CAA region and have enough publicity so that all interested parties can be given the opportunity to submit their views." . . . CAB is willing but appropriations for field hearings have not been made by Congress. . . . Most people here look for airline regulations to remain much the same until well into the post-war era. You can hope for more immediate reduction of lightplane regulations—but don't get your hopes too high. . . Speaking of the Board, Chairman Welch Pogue is being given much of the credit for getting transport planes back to the airlines. According to present plans, approximately 100 will be returned by early fall, small airlines getting first consideration. Most potent of the Pogue arguments was that DC-3's are coming off the line at such an accelerated rate it is estimated that there will be some 15,000 of them in operation by this time a year from now—and that's saying nothing about other civilian transport models. . .

Planes

Nobody who knows them will be surprised to see the lightplanes figure in the invasion news. The little low-powered jobs already have done remarkable flying in evacuation work in the Burma jungles, as well as liaison, reconnaissance, emergency supply and artillery fire direction duties, and it seems reasonable to suppose that they will serve well in similar capacities in France. The ambulance version carries a standard litter.

Modification Letters

Lest FLYING readers wonder why they were not kept up to the minute on the P-51X, the B-17Z or other ultra-modern versions of Army or Navy combat types, here is the reason. Early in the war, both the Army and Navy asked all publications not to publish modification letters, as they told the enemy how far ahead we were working on any given airplane. As we went to press, however, the Army lifted its long-time ban on modification letters, for the first time since the beginning of the war. From now on FLYING'S readers will get these data.

U-Build-It

Although CAA has, as yet, no definite plans for a lightplane capable of being built by high school vocational students, as rumored this spring, work has been done by CAA design experts in anticipation of such a post-war need. A. A. Vollmecke, chief of CAA's aircraft engineering division, has done most of the design work. The plane now on the drafting boards is high-winged, dual-control. . . The statement made not long ago by Dr. Harry Ganders, Dean of the School of Education at Syracuse University and a CAA consultant, that the plane would cost only $700, also needs qualification. Counting the cost of buying and installing an engine, plus a hypothetical labor cost to build the frame, the $700 figure is too low; leaving out engine and labor costs, it's too high. . . . CAA is handling the project with extreme caution in order not to interfere with post-war plans of lightplane manufacturers.

Post-war Lightplanes

Most immediate good news of significance to private flyers on the eastern seaboard is the recently organized Congressional Flying Club in Washington, which plans to give flight instruction to members of Congress and their Secretarial staffs. Significant point: the instruction, if plans go through, will be at Congressional Airport, Maryland, since the beginning of war a part of the eastern area banned to private flying. If Congressional is opened, private flyers hope that similar action will lift the Army ban all along the coast. . . . Sparking the Congressional Flying Club is Rep. Jennings Randolph of West Virginia, long an aviation leader on the Hill. NAA has arranged to make the club a chapter of its organization. . . . Flight instruction will be supervised by Arthur C. Hyde, former Congressional Airport fixed-base operator and a CAP Wing Commander for Maryland and the District. Piper *Cubs* and Taylorcrafts will be used. . . . After an exhaustive survey of U. S. lightplane possibilities post-war, an Australian commission has reported to the home office that all private craft designed in the United States for the mass market will be two-control, stall and spin-proof. . . . Another development in post-war roadable lightplanes may be beyond the talk stage, according to reports received here from Chance-Vought observers in Connecticut. Unless our informants are completely wacky, this model looks like a flying hamburger roll, is twin-engined, and can be seen almost any day flying off Connecticut beaches. . . .

Quarantine

Look for an announcement fairly soon of an international convention for framing post-war airways quarantine regulations. The convention will grow out of meetings held during the spring and summer of the Interdepartmental Quarantine Committee, whose members include experts from Public Health Service, Army, and Navy concerned with war-time quarantine problems. . . . Liaison members of the committee include representatives of the Department of Agriculture, the Coast Guard, and the Civil Aeronautics Ad-

(*Continued on page* 142)

A FOUR-POINT PROGRAM

1. *Adequate Air Forces*

2. *Overseas Air Bases*

By

E. E. WILSON

Chairman, Board of Governors, Aeronautical Chamber of Commerce of America

FOUR guiding principles for American air power policy which may prove of enormous significance for wartime and post-war aviation have been proposed by the Board of Governors of the Aeronautical Chamber of Commerce of America. This program proposes that the United States maintain an air power sufficient to win this war and keep the peace by these methods:

1. By maintaining adequate *air forces* at such strength and in such state of readiness as to preclude a successful assault upon our country or its possessions.

2. By acquiring and maintaining *air bases* essential to our security and that of overseas trade.

3. By facilitating the orderly and economic expansion of domestic and international *air transport* and of private flying.

4. By preserving a strong *aircraft manufacturing industry.*

To indicate the need for strong air forces, ACCA traces the development of American aviation since the first World War. It cites the parallel between air bases and sea bases for national defense and foreign trade. Air power, like sea power, must be regarded as an investment in national defense and international commerce. Since the aircraft manufacturers sell most of their production to the Government, they are peculiarly dependent upon Government policy. Every effort must be made, simultaneously, to strengthen air transport, which in turn strengthens the aircraft manufacturing industry.

Summarizing its viewpoint, the ACCA says:

"International, domestic and private *air transport* offer a source of new wealth and employment. Rapid development is dependent upon improved technology stemming from a strong competitive private *manufacturing industry.* A dominant military and naval *air force* supported by *air bases* is a prerequisite of free communication by land, sea and air. Only an air-minded people can provide that controlling air power.

"Ours is the dominant air power. Ours, too, the responsibility for a sound policy, courageously administered. The American air power policy derives directly from our own experience."

That experience goes back to the outbreak of World War I, when the United States was wholly unprepared, particularly in aviation. We entered the war with no military airplane designs and no military engines of our own. We sought to overcome this disadvantage by adapt-

FOR AVIATION ☆ ☆ ☆ ☆

Aeronautical Chamber of Commerce proposes plan for strong U. S. air power.

ing foreign designs to automotive mass production and belatedly trying to create new ones of our own. Though a valiant effort was made, the brief 19 months of our participation was not enough to bring American-designed aircraft into combat.

The sudden armistice of November 11, 1918, found us as unprepared for peace as April 6, 1917, had found us unprepared for war. We had neither adequate policy, program or organization for terminating war contracts or for the custody, storage or disposal of surplus goods or plants. As a result, there was vacillation, confusion and hardship. "War profits" proved illusory. Companies without adequate reserves or surplus failed. Automotive companies went back to automobiles. What little remained of the aircraft industry floundered. Some even thought the Army and Navy should design and build their own aircraft. But in 1925 President Coolidge appointed the Morrow Board.

This board was requested by the secretaries of War and Navy. These requests were in turn the result of representations by the aircraft industry whose importance to the Army and Navy was pointed out.

The Morrow Board consisted of nine members appointed by the President. Their number included a retired general, a retired admiral, two outstanding engineers qualified in aeronautics, a member of the Senate Committee on Military Affairs, a member of the House Committee

(*Continued on page 92*)

Board Members Endorse Program

Besides the author, the following aircraft industry officials, members of the ACCA Board of Governors, endorse this statement of principles:

VICTOR EMANUEL, President, The Aviation Corporation

E. R. BREECH, President, Bendix Aviation Corporation

P. G. JOHNSON, President, Boeing Aircraft Company

HARRY WOODHEAD, President, Consolidated Vultee Aircraft Corp.

GUY W. VAUGHAN, President, Curtiss-Wright Corporation

DONALD W. DOUGLAS, President, Douglas Aircraft Company

J. CARLTON WARD, JR., President, Fairchild Engine & Airplane Corp.

ROBERT E. GROSS, President, Lockheed Aircraft Corporation

GLENN L. MARTIN, President, The Glenn L. Martin Company

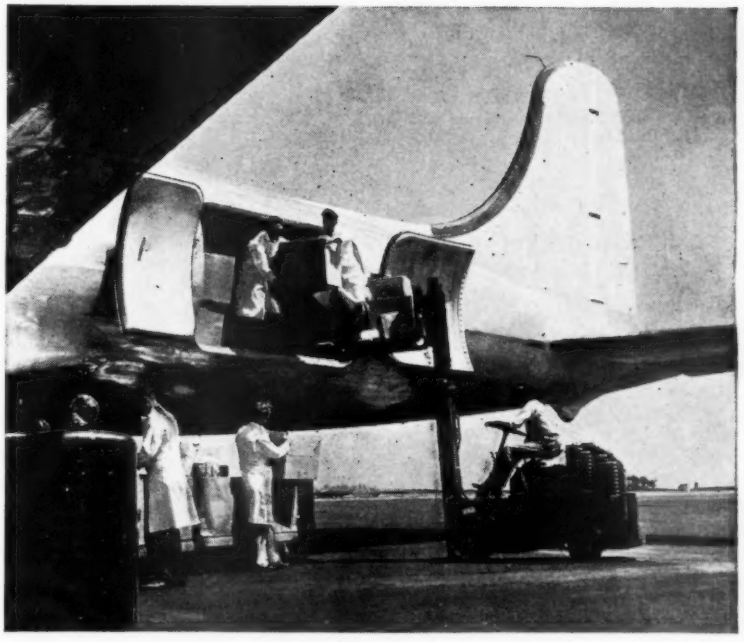
J. H. KINDELBERGER, President, North American Aviation, Inc.

ALFRED MARCHEV, President, Republic Aviation Corporation

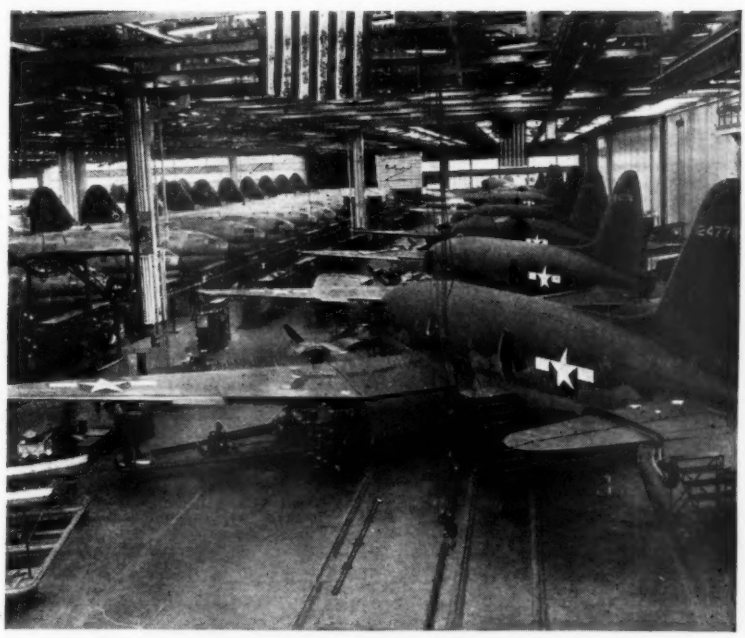
T. CLAUDE RYAN, President, Ryan Aeronautical Company

E. E. GILLMOR, President, Sperry Gyroscope Company, Inc.

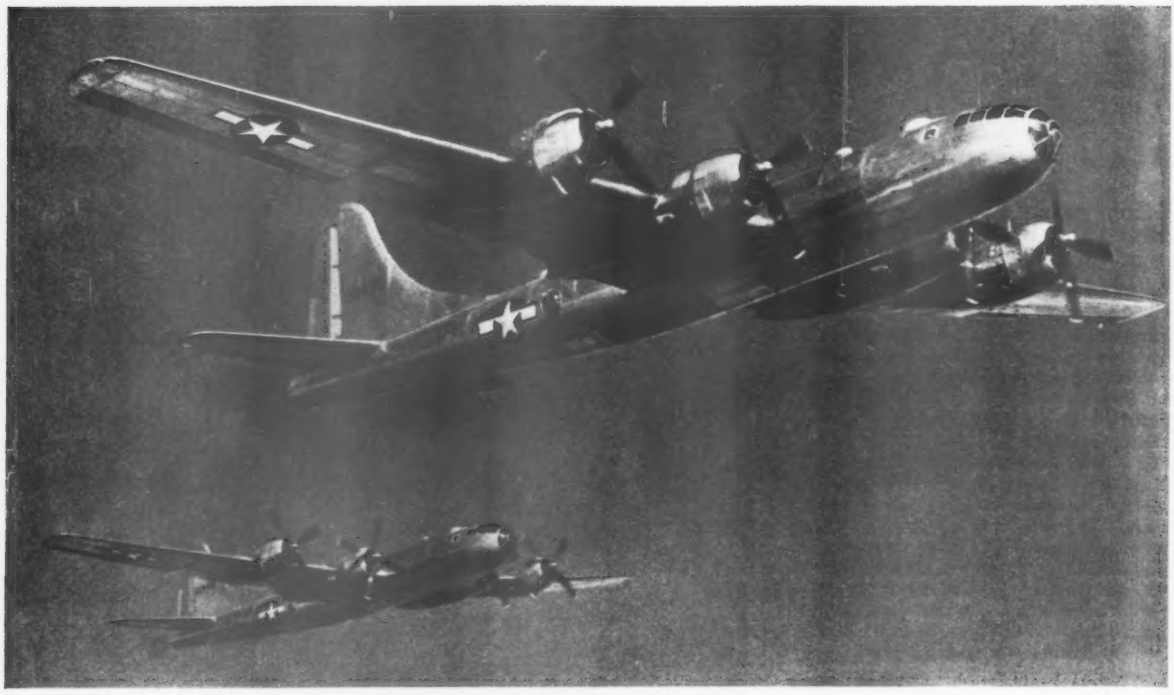
CLAYTON J. BRUKNER, President, The Waco Aircraft Company



3. *Expanded Air Transport*



4. *A Strong Industry*

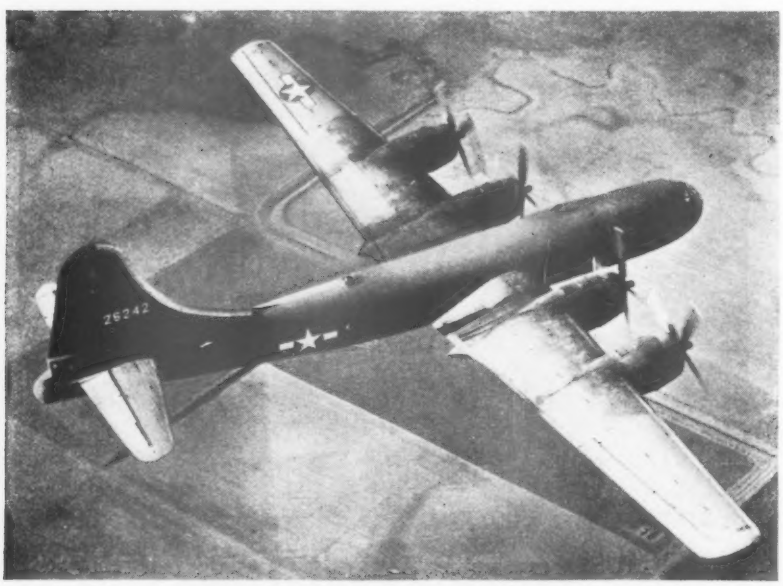


At first glance, the Superfortress looks a good deal like the smaller Flying Fortress.

THE B-29

by MAX KARANT

This is the story of one of the best-kept American air power secrets, recently loosed against the Japs.



The B-29 from above. All gun turrets have been obliterated from these pictures by the Army.

This article was written several weeks ago, just after a group of writers were introduced to the giant for the first time at Wichita, site of one of the Boeing factories. It was written with the understanding that it would be released as soon as the first announcement that the B-29 had been in action was issued by the AAF. As this issue went to press, the first attack on Japan was carried out.—Ed.

MARK April 1, 1944, in your war diary as a memorable day in air-war history. For on that day a whole new United States Army Air Force—the 20th—was officially activated. The 20th Air Force is the most unusual air force anywhere. It is worldwide in scope and was conceived, founded and exists today solely for one new, deadly American bomber: the Boeing *Superfortress* (B-29).

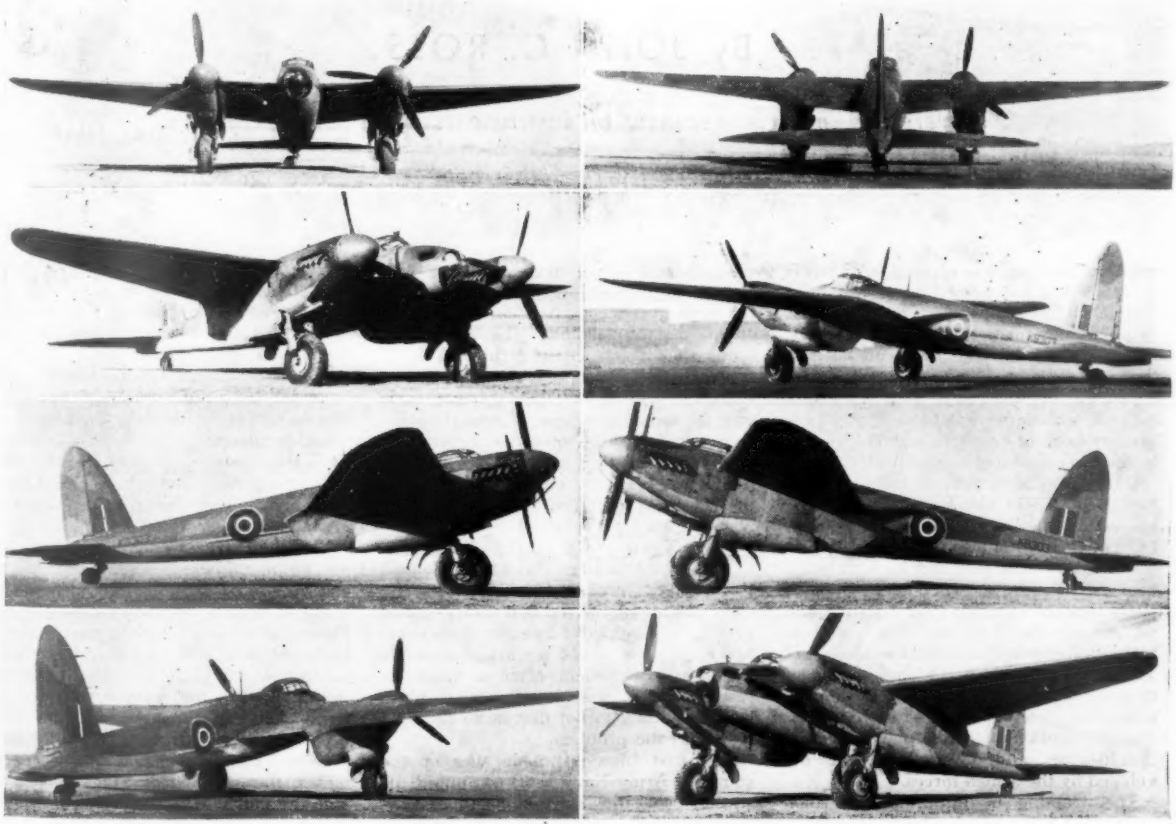
The B-29 has been whispered and rumored about by friend and enemy since May 17, 1941, the day the first of three XB-29 experimental bombers rolled out the door of Boeing's Seattle factory. By the time the first production model of the B-29 came off the line in Seattle in December, 1943, Army Air Forces bombardment experts, under the direct leadership of General Arnold, realized that they now had an airplane that could not be made to conform to any previous pattern. That realization led directly to the conception of the 20th Air Force.

All *Superfortresses* (AAF crews rarely use that unwieldy name; they have compromised by calling it the "Super", or just plain B-29) belong to the 20th Air Force. The Joint Chiefs of Staff and General Arnold command the 20th. Brig. Gen. H. S. Hansell, Jr., a bombardment expert re-

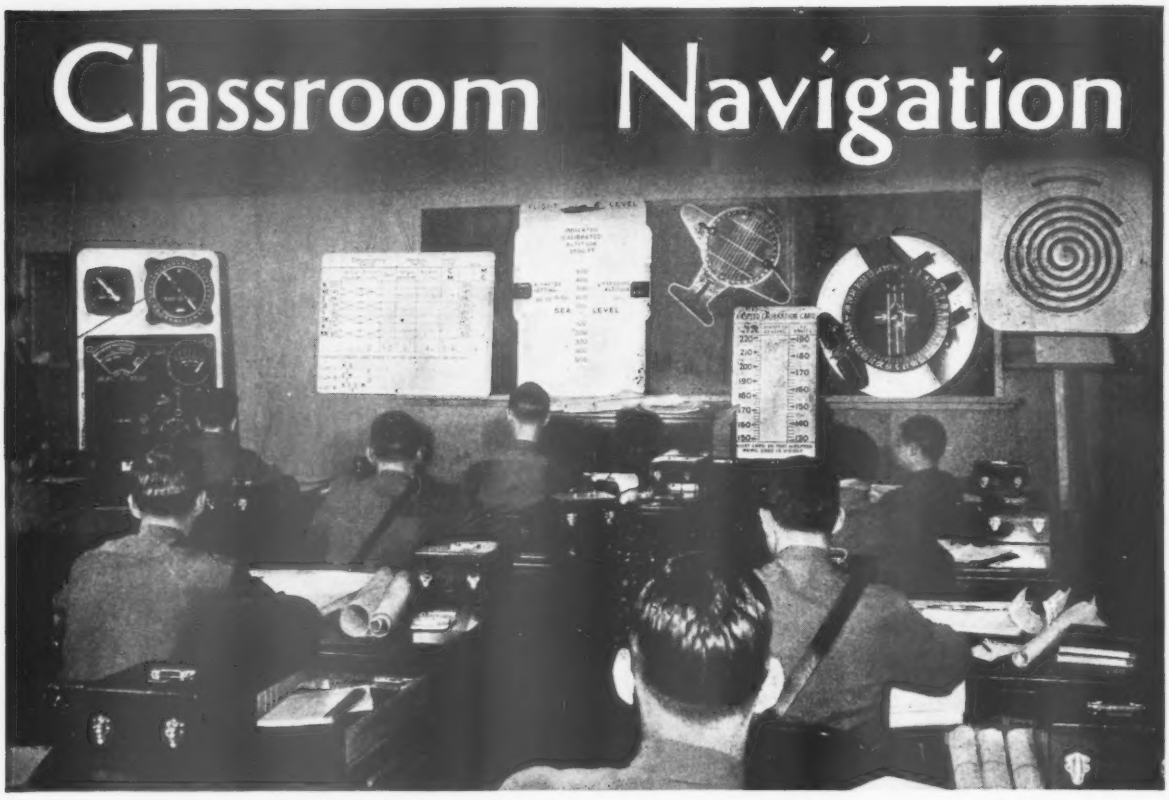
(*Continued on page* 124)

'Skeeter'

MANY airmen today, American as well as British, say the DeHavilland *Mosquito* is the world's best all-round military aircraft. In any event, the RAF must believe this to be true, as it is using so many versions of the *Mosquito* it is difficult to keep track of them. There are fighters (day and night), bombers (each carrying a 4,000-pounder to Berlin), fighter-bombers, photo-reconnaissance planes, transports and so on. The version shown here is the standard bomber. *Mosquito* above was built in Canada.



Classroom Navigation



Cadets studying navigation at AAF school, Hondo Army Air Field, use oversized instrument training aids shown here.

By JOHN C. ROSS

Oversized models, replicas of instruments used by navigators, help navigation trainees "fly the classroom" any place on earth.

THE widespread use of visual education techniques has been one of the most unusual developments of the war. Training men for the hundreds of specialized and often extremely difficult tasks in the armed forces has been accompanied by the development of revolutionary educational techniques created out of an ingenuity born of desperation. The results have been amazingly successful.

One of the most difficult training tasks has been that of developing aerial navigators capable of guiding their planes from one tiny island to another, or to pinpoint bombing targets and back to home bases. The art of navigation, which took years to learn in peace-time days, has had to be taught in 18 weeks. The oversized training instruments which have been developed to help teach students in navigation are among this group of brilliantly conceived training aids—ranking with training motion pictures, plane recognition devices, and other visual aids developed by the armed forces.

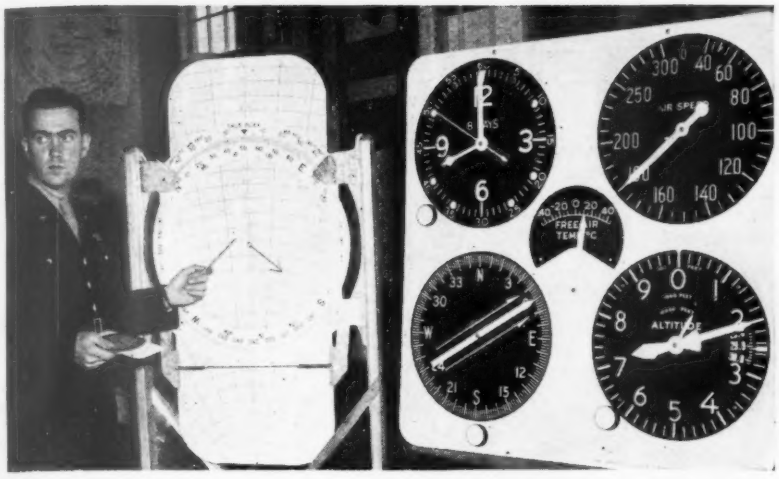
The training of hundreds and then thousands of aerial navigators was first attempted in regulation classroom fashion with verbal instruction and using standard-sized models. The AAF soon found that it was virtually impossible to try to teach every instrument verbally. The first step in developing visual aids was to make blow-ups of small instruments which were mounted before the class. The instructor then worked out navigation problems on the blow-ups and the students followed him using small instruments.

The first use of instrument blow-ups at the Army Air Forces Navigation School, Hondo, Tex., was strikingly successful. One instructor declared that under the old system, he doubted if five out of an average class of 40 could work out a simple interception problem after a two-hour session. After the blow-ups were used, he was willing to bet that 30 to 35 could work out the problem.

The first blow-up made was of the standard Army-Navy E-6B computer. Its success set the stage for others—the Weems plotter, then the pressure correction demonstrator, the aperiodic compass, the dummy blackboard, and the drift meter. Later, other over-size blow-ups were made.

The first over-size models were roughly hand-painted. But the Hondo experiment was so successful that the Training Command decided to place the blow-ups in all navigation and bombardier schools. Now a Training Aids division of the AAF in New York is spreading them around to all types of training units.

The simple hand-painted models could not be manufactured with enough precision or in large enough quantities, however. The Army, therefore, called on G. Felsenthal & Sons, Chicago plastics manufacturers, who make many of the original navigation instruments. Felsenthal designed models for mass production, accurate and each identical with its prototype in everything but size. Production is carried out through a simple process by which the printing is silk-screened on Vinylite plastic or masonite.



Hypothetical problems set up on instrument panel at right demonstrate computer operation.

Using an overgrown navigation instrument board and the oversized navigation devices, the instructor and his class at Hondo can "fly the whole room" on all headings and with a wide range of altitude, airspeed and temperature. Each student is required to set his watch accurately, and then is taken over a rapid flight in which he is kept hopping in order to maintain his log entries. The board also has considerable value in altitude computation training for bombardiers.

The flight data, such as barometric pressure, target and runway elevation, are furnished on a simulated flight board. The instruments are set initially for runway conditions. The class may be flown to a desired indicated altitude and the instruments set for any desired conditions. Making use of bombing tables and computers, the students are required to compute correctly the true altitude above target, true airspeed, trail and disc speed. The instruments may be reset for a change in altitude and the data recomputed.

Such instrument training satisfactorily replaces instrument instruction in the air. It saves time and money and permits the teaching of students with a vastly improved skill over what would be necessary if their training were confined to brief sketchy periods in the air.

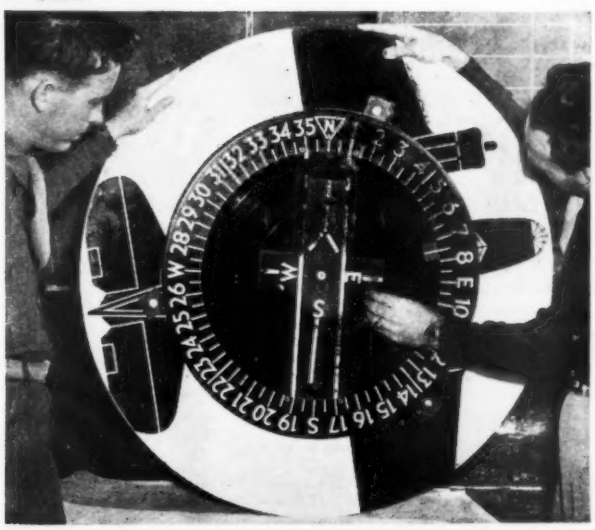
The navigation instrument board and the enlarged model of the E-6B computer work together. Dead reckoning navigation really is the application of various problems in mathematics—and a portion of the computer is really a circular slide rule. The instructor shows the class how to take the air speed and compass headings from the model board, and, figuring the wind, obtain ground speed and true courses. The computer soon becomes a versatile device in the hands of the students. They learn how to change nautical miles to statute miles or kilometers. They make corrections for altitude and airspeed and determine time, speed and distance if two of these three factors are given.

Typical oversized training aid is the drift meter—with which the student determines how much "crabbing" the plane will have to do to follow its course in a cross wind. Shaped like an airplane with a much enlarged, movable drift meter superimposed on it, the model is operated by the instructor. He explains that an object on the ground—a house, a haystack or even a wave—must be tracked down a grid of parallel lines set true with the heading.

If the object follows the track precisely there is no drift. If it does not, the circular calibration ring is turned, thereby moving the grid lines, until the object and parallels are aligned. Then the amount of drift may be read on the scale. The navigator notifies the pilot the number of degrees to allow, the pilot turns the plane slightly into the wind, and the plane flies a true course.

(*Continued on page* 152)

A navigation instructor demonstrates use of drift meter by working oversized instrument training model



Model of aperiodic compass teaches cadets to read multiple headings of navigator's compass and correct for deviation.

The AIRCRAFT FACTORY

Typical front covers of some of the hundreds of house magazines which are proving so valuable to aircraft and allied industries.

GOES TO PRESS

By RICHARD O'CONNOR

Feature Writer, Los Angeles-Herald-Express

House magazines play a vital part in employee and industrial relations programs of aircraft industry.

WHEN an eager-faced worker moves down the assembly line in an aircraft plant, asking questions, jotting down notes, ferréting around like an amateur Winchell, he's neither an inquisitive malingerer nor an Axis spy. These days he's his department's news correspondent, for the employees' newspapers and magazines have wrapped their tentacles around every worker in the plant.

Three years ago the journalism of aircraft factory employee periodicals was on a par with a small high school paper, a blurred pamphlet turned out on a duplicating machine and hardly legible to the few workers who attempted to read it. It was a forlorn stepchild of public and employee relations offices.

Now the factory newspaper or magazine bears a highly professional imprint. It's as streamlined as a national picture magazine; usually printed on slick paper; written and edited in a metropolitan style, yet localized to the "doings" of every person in the factory, from its administrative head to the newest riveter. Today these colorful and sleek periodicals are distributed free to hundreds of thousands of aircraft workers throughout the country, cost millions of dollars to produce annually and use thousands of tons of priority-allotted newsprint.

How much money they spend on publication of these periodicals annually the aircraft companies do not disclose, but the slick paper, the color pictures and the large staffs gathered to edit them in a professional style are a large item on any budget. Only a few of the periodicals accept advertising to balance the unpaid circulation.

In the past three years the value of plant magazines has been proved for at least three purposes:

1. *Employee morale.* Through these periodicals, edited for and written in large part by them, employees are kept informed of the vital nature of their jobs. By reporting on the battle performances of the planes they help to build, the employees are made to realize that they have a direct part in the war effort. They are made conscious of themselves as individuals, rather than as small cogs in a huge and complex machine, by seeing their names and those of fellow workers in print.

2. *Production boosting.* Workers are told of the necessity for production increases, and praised in print and photograph for contributing ideas on how techniques can be improved.

3. *Materials conservation.* Employees are shown how wastage of materials and abuse of their tools and equipment can drain the resources of the nation.

The staff of Airview News confers at parent plant of Douglas Aircraft Company. House magazines employ from one to more than a dozen trained journalists each.

None of these three purposes are pounded into the employee. They are "sugar-coated" by use of pictures, illustrations, cartoons. The lessons are driven home with a wry humor rather than a verbal hammer. The worker is amiably educated at the same time he is amused.

To accomplish this rather subtle job, the larger plants maintain a staff of from six to a dozen persons trained in newspaper and magazine technique, as part of their public relations departments. The smaller plants employ an editor and possibly an assistant to turn out their periodicals. But the backbone of all these publications is the worker on the assembly lines. He makes the news—and often he writes it.

In every department a representative of the plant newspaper "covers his beat" in addition to his regular job. Intensively covered are all employee activities, clubs and sports. The worker realizes he is the inhabitant of an industrial city apart from the community in which he lives . . . and that his role as a citizen in the former is as important, or temporarily more important, than as a resident of San Diego, Seattle or Burbank.

From a smeary mimeographed sheet, the plant paper has evolved into a streamlined periodical that hundreds of thousands of aircraft workers regard as a combination of their hometown paper, newsmagazine and work guide.

Typical of the scores of aircraft employee periodicals published throughout the nation are these:

The *Flying Reporter,* published by Ryan Aircraft, started as a mimeographed sheet and is now a tri-weekly, printed in magazine format on slick paper. It is distributed to all Ryan employees, plus about 1,000 copies to former employees, the Army and Navy, and to newspaper and magazine editors. It is edited by

Keith Monroe, with Sue Zinn Gunthrop as his assistant, under Public Relations Director William Wagner.

On the cover is an eye-catching action picture, usually, with a message from President Claude Ryan on the first inside page. Sprinkled throughout are pictures of personalities, executives and workers and their accomplishments over a three-week period, also the experiences of former Ryan workers on the battlefronts. There are columns of news from each department and employees' club. "Beauty Isn't Rationed" is a regular feature telling the feminine workers how to be beautiful and useful at the same time.

A cartoon tells workers how to maintain their vitality through proper diet, and puts over its message with a dash of humor. For example, one cartoon declared, "You Can't Breakfast Like a Bird and Work Like a Horse," advising a hearty breakfast as a safeguard against the "mid-morning slump."

One recent issue featured a five-page spread on "Employees' Day" when the families of workers were invited into the plant to see "how and where we work."

North American's "chain" of weekly newspapers, one for each of its three major divisions in Inglewood, Calif., Kansas City and Dallas, is augmented by the bi-monthly *Skyline*, a super-slick with a two-color job inside and multi-color covers.

Director of Public Relations Kenneth Macker oversees a large staff at the publication headquarters in Inglewood, as well as in the subsidiary plants. *Skyline* is edited by Clarence Beardslee, under the direction of an editorial board consisting of Macker and three associate editors, Jerry Luboviski, Andy De Shong and Abrian Sorrells. Separate staffs handle the three weeklies, the Inglewood *Skywriter*, the Kansas City *Ameri-Kansan* and Dallas *Take-Off*.

Superior photographic and illustration work is a feature of the North American publications, with the Inglewood headquarters alone having three photographers and two artists available.

"Willie Wingflap," an impish cartoon character, is drawn by a North American artist, Dennis McCarthy, and has proved so popular that the cartoons are being collected in book form for immediate publication.

The news and feature stories in the three weeklies are mainly of local interest, with a few stories of factory-wide importance. Departmental gossip, sports and personalities, all profusely illustrated, are "played up" in the five-column tabloids.

Skyline, however, stresses illustrated stories on the performance of North American planes on the battlefronts, with emphasis on the part the workers are playing in helping to defeat the enemy.

Doak Aircraft Company of Torrance, Calif., is one of the smaller plants, but its slick-papered monthly magazine, edited by Lee Weinstein, has included an abundance of editorial ingenuity in its 12 pages.

In the *Doak Digest* was published the famous "Line Language" double-page feature which has often been reprinted throughout the country as a quick and pithy guide to blueprint reading.

"Something more charming than a chair," as the *Digest* understated, was used as model for a blueprint reading illustration. The model was "Billie," a shapely and thinly-clad young lady whose dimensions were measured as an illustration of how to read a blueprint.

The *Digest* pointed out:

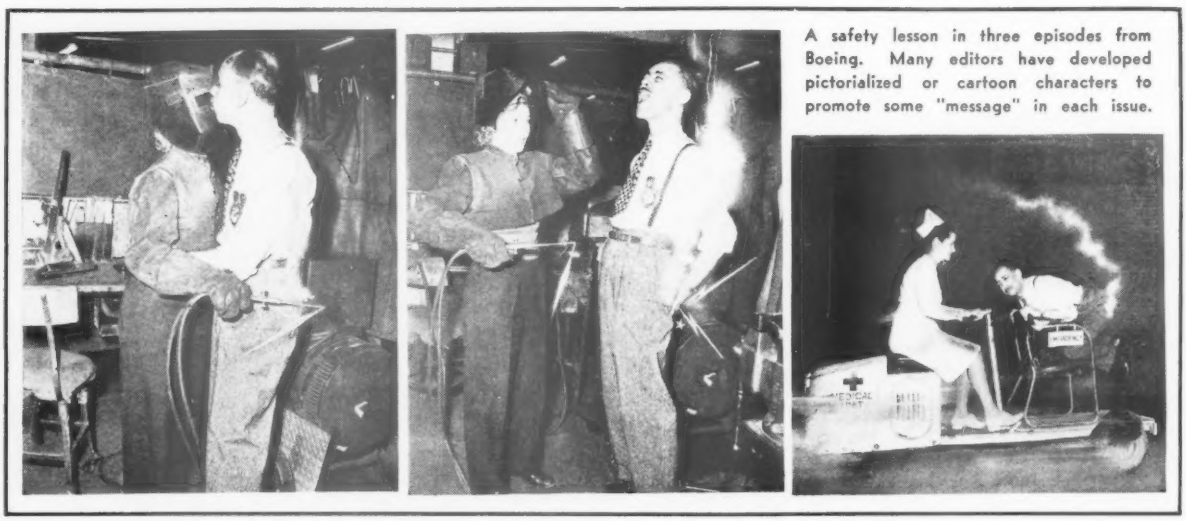
"If you study Billie carefully, you will discover that blueprint reading can be a simple, unadorned and fascinating subject."

Thousands of workers, eyeing reprints of Billie on the blueprints, agreed enthusiastically—and painlessly absorbed the lesson.

Lockheed's publications are typical of the larger aircraft companies. Published weekly is the Lockheed *Star*, with a circulation of 77,000, and monthly, in magazine format, the Lockheed *Aircraftsman*, of which 51,000 copies are distributed. Five other periodicals, of less general interest and circulation, are also published under the supervision of Bert Holloway, head of the publicity department.

The *Star*, edited by Maxwell Stiles and Hal Rosson, appears weekly at all the Lockheed plants, with replates carrying local news for the units at Fresno, Santa Barbara, Pomona, Bakersfield and Taft. A recent issue carried a front page story on "Two of Our Highways Are Missing," relating the production and supply difficulties caused by mountain snows. Another story told of the work of *Ventura* patrol bombers on a raid on the Kuriles. "Food Finds" is a weekly feature offering a prize for the most nutritous vegetable recipe. The *Star*, printed on slick paper, is in tabloid format.

The *Aircraftsman*, one of the few aircraft plant magazines carrying advertising, and little of that, is edited by Jerry Farrar and published under the auspices of the Lockheed Employees' Recreation Club. It contains profusely illustrated articles on Lockheed workers, departments and activities.



A safety lesson in three episodes from Boeing. Many editors have developed pictorialized or cartoon characters to promote some "message" in each issue.

Also published by Lockheed are six other special-purpose periodicals:

Engineering, a semi-monthly paper for employees of the engineering department, is devoted to technical news and has a circulation of 2,500. *Field Service Facts* is distributed weekly to employees in the Lockheed field service and contains news of their activities. The *Global Service Log*, with articles on Lockheed activities and performance of its planes, is distributed to 5,000 servicemen, airline executives and Air Forces personnel.

Hangar Flying is a unique monthly published and written by Lockheed test pilots for Army Air Forces pilots, with a circulation of 6,000. It is brightly written and illustrated, with cartoons by Dick Shaw which humorously illustrate the flying lessons, on Lockheed planes, which test pilots want the combat pilots to learn quickly.

Let's Eat is a monthly booklet with a circulation of 20,000, edited by the Lockheed medical department and containing

(*Continued on page* 120)

DILBERT, USN

By JOHN B. GOODMAN

Dilbert was just an accident waiting to happen but he is credited with reducing Naval pilot training errors.

DILBERT is the daffiest, dopiest, dumbest aviator in the Navy but he'll never be washed out.

He's the guy who tutored to get into kindergarten; who slept through ground school; who "flat-hats" the admiral's barge; and who gives his flight instructors acute indigestion and insomnia. He is the most hideous example of what not to do in an airplane.

Dilbert is a fictitious character developed by the Navy's Aviation Training Division to point up pilot errors. In graphic subtleness he tells the inexperienced pilot the facts of long life without dampening his enthusiasm for learning.

Already he has caricatured more than 1,000 "boners" in a Naval aviator's career His antics are portrayed in brightly colored and black and white posters distributed to all Naval air stations, aircraft carriers, seaplane tenders and everywhere else that U. S. Naval aviators are to be found.

Dilbert—goon though he is—is credited with being one of the best reasons for reducing pilot errors in the Navy's training program.

Of course, it is impossible to say that so many lives or so many airplanes have been saved by Dilbert's mistakes. The fact is, however, that the little guy is so well known in the Navy and has earned such a reputation of what-not-to-do, that no aviator wishes to be a Dilbert in real life.

The name Dilbert has become synonymous with the wrong way to fly and the wrong things to do.

"I certainly pulled a Dilbert today," a pilot irritated at his own mistakes may frankly admit. Nobody in Naval aviation ever wants to be a Dilbert if he can help it. It's like having the hives.

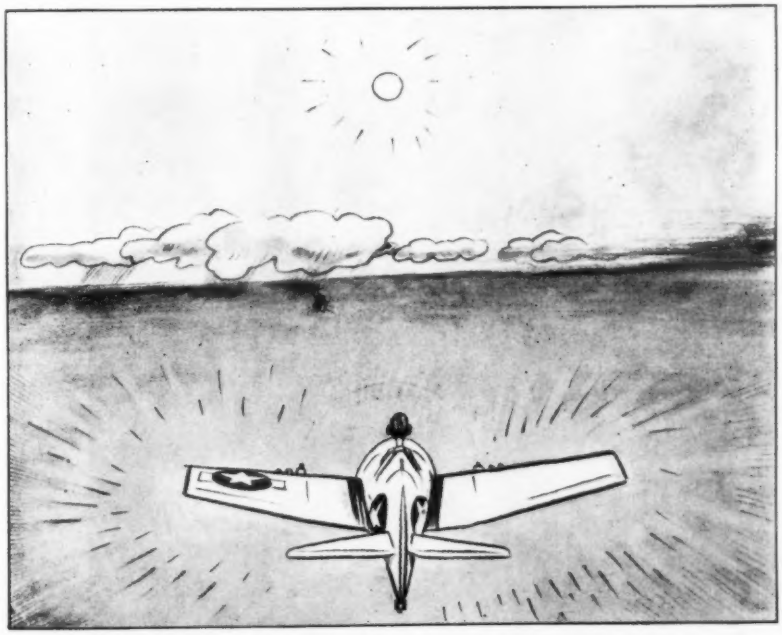
Pilots, solemnly study the Dilbert poster for the day on the bulletin board in the ward room or in the hangar.

At some stations, the pilot who has pulled the worst boner of the day will be awarded a "Dilbert for today" placard, either to be put around his neck, like the Congressional Medal, or at his place at the mess table.

Dilbert was "born" back in the early, hectic days of the war. He was conceived by Comdr. (now Capt.) A. K Doyle, USN, Comdr. (now Capt.) A. K. Morehouse, USN, and Lieut. (now Lieut.

(*Continued on page* 130)

Lieut. Comdr. Robert C. Osborn, USNR, creates all Dilbert posters for the Navy



"Dilbert didn't like to take advantage of the Japs by using squalls, clouds, sun glare or dusk for attacks."

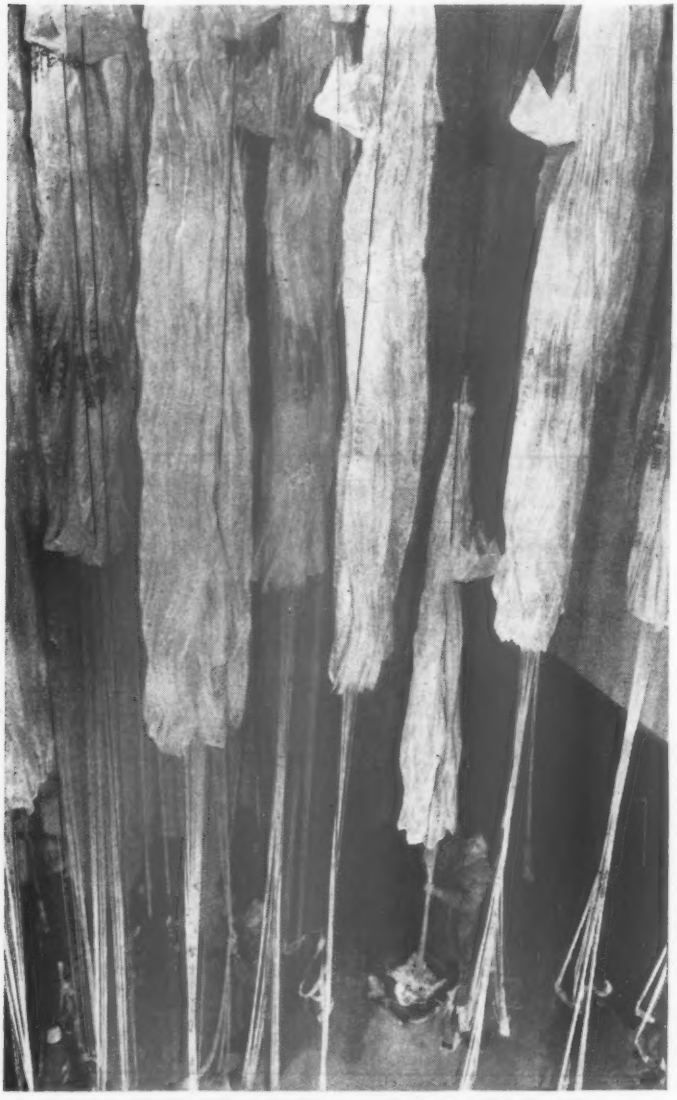
Nylon LIFE SAVERS

The pay-off. Pilot grasps parachute's rip cord grip.

By O. J. MINK

Manager of Operations, Parachute Division, Reliance Manufacturing Company

Spurred by war, an overall factory has become the world's largest parachute-making plant.



Soldiers dry parachutes dampened by grass or humidity during jumps.

EARLY in the morning of June 6, the greatest fleet of transport aircraft ever assembled, numbering more than three times the total of transport planes operated by commercial airlines in the United States before the war, was waiting on the airfields of England.

The planes were Douglas *Skytrains*, each loaded with 24 fully-armed and equipped soldiers. When the signal was given and the planes took off for the invasion, each soldier wore a nylon parachute.

The transports had to take off in the dark from scattered airfields, attain formation, and fly across the English Channel to drop their forces at dawn behind the German defenses.

They flew low, only 200 to 300 feet high. Then, over their objectives, the planes climbed to 400 to 600 feet and emptied in a few seconds. Thirty seconds later the paratroops were on the ground.

Following this greatest airborne force ever known, freight-lugging airplanes dropped their burdens through the air—supplies for the paratroops, falling to earth beneath canopies of yellow, dark blue, red, green, and camouflage brown and green. The skies over France carried parachutes ranging in size from 14 inches to 50 feet on invasion day.

Beneath the swaying canopies, each distinctively colored depending on its burden, floated radio kits, ammunition, guns, messages, first-aid supplies. Unassembled artillery pieces pounded to earth for quick assembly.

How can such frail cloth canopies sup-

Nylon chutes dry faster than silk, are less subject to mold and salt water deterioration.

port burdens up to several thousand pounds? What are the parachutes made of, and how are they made?

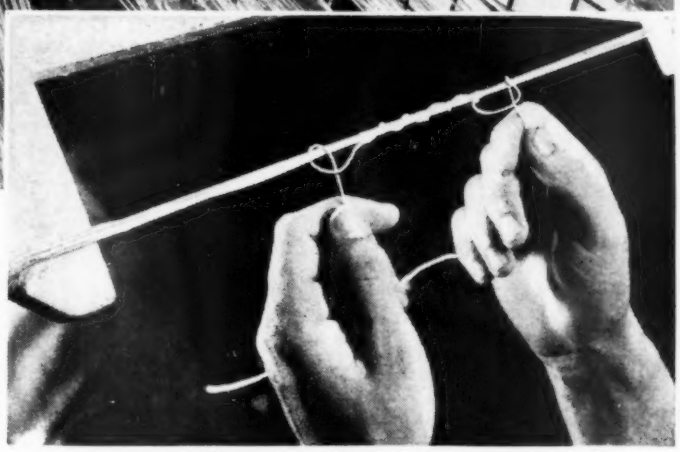
Strength is of prime importance. Compactness, because a modern 24-foot parachute consists of some 65 yards of fabric plus 700 feet of line, must be considered. The material must have sufficient elasticity to absorb the opening shock and immediately regain its normal shape. And it must be lightweight.

Until the Pacific war, silk was the answer. Fortunately, experimental work had already been carried on with nylon. Rayon was known to be useable and cottons had been tested. Linen and duck, from which some earlier parachutes had been made, were ruled out. Final tests indicated that nylon was a better parachute fabric than silk and that silk was more satisfactory than rayon or cotton.

Today's parachutes, therefore, are manufactured from nylon, rayon and cotton. They would be nylon exclusively if it were plentiful enough. Parachutes used for aerial delivery—where a life is not floating in the balance—are made of rayon. Some of the smaller sizes are cotton. Those used by airmen and paratroopers, or wherever a human life is at stake, are nylon.

A chute must be entirely free from moisture or dampness before being packed or repacked. Nylon absorbs little water and hence dries quickly.

(*Continued on page* 101)



Making rip cord. At one end of cord is a metal grip. At the other are locking pins which spring pack when pulled.

Two-needle machines sew the four pieces of each panel together, then this "four-needle girl" joins the panels.

Procedure When Wearing Conventional Seat or Back-Type Parachute

When an emergency develops in the air and it becomes necessary to bail out of your airplane, there is no time for confusion or second-guessing. The procedure must be automatic. The instructions below, and the diagram, show through what hatches and in what order crew members should make their exit. Ground drills based on this procedure will help you obtain the efficiency and speed necessary to abandon your airplane successfully and safely. Wherever possible, jump from the after end of the hatch. Where several crew members bail out of the same exit, each should inspect the others to make sure that all are wearing a full complement of equipment securely fastened.

PILOT—Exits fourth out forward end of bomb bay. (Alternate exit, out front entrance door.) Is last to leave plane.

CO-PILOT—Exits second through forward end of bomb bay.

BOMBARDIER—Exits second through front entrance door.

NAVIGATOR—Exits first out of front entrance door.

UPPER TURRET GUNNER—Exits first out forward end of bomb bay.

RADIO OPERATOR—Exits third through after end of bomb bay.

RIGHT WAIST GUNNER—Exits second through main entrance door.

LEFT WAIST GUNNER—Exits first out main entrance door.

BALL TURRET GUNNER—Exits third out of main entrance door.

TAIL GUNNER—Exits through small emergency door in tail.

Procedure When Wearing Quick Attachable Chute Harness . . .

When the order is given over the inter-com to "Abandon Airplane," each crew member will remove the individual seat-type dinghy and breast-type parachute from their respective positions near his station, snap them onto his QAC harness, and exit through the hatch specified. The following instructions, used with the diagram, show the positions of the dinghies and the parachutes, the correct exit hatch, and the order of bailing out. Where several crew members bail out of the same hatch, each should check the others to make sure that all are wearing a full complement of equipment, securely fastened. Wherever possible, jump from the after end of the hatch. Remember, a life vest should be worn under the QAC harness on all over-water flights. The lanyard on the dinghy should be snapped onto the D-ring on the life vest.

Periodic ground drills will familiarize your crew members with the operations of the QAC harness and the order of bail-out.

PILOT—Parachute mounted on floor, directly behind pilot's seat in pilot's cabin. Dinghy worn in seat position. Pilot is fourth to exit through forward end of bomb bay. (Alternate exit, out front entrance door.) Last to leave plane.

CO-PILOT—Parachute mounted on floor directly behind co-pilot's seat in pilot's compartment. Dinghy worn in seat position. Exits second through forward end of bomb bay. (Alternate exit, through front entrance door.)

BOMBARDIER—Parachute mounted in navigator's compartment on starboard wall directly opposite navigator about half-way up on wall. Dinghy mounted in navigator's compartment near floor on starboard side, half the distance forward from bulkhead. Exits second through front entrance door.

NAVIGATOR—Parachute mounted on bulkhead armor plating directly above door, on inner side of navigator's compartment. Dinghy mounted alongside and to rear of bombardier's dinghy. Exits first through front entrance door.

UPPER TURRET GUNNER—Parachute mounted on floor just forward of bomb bay bulkhead on port side. Dinghy mounted on forward wall of bomb bay bulkhead in turret compartment, directly below entrance to bomb bay. Exits first through forward end of bomb bay.

RADIO OPERATOR—Parachute mounted on starboard wall just forward of rear bulkhead of radio compartment, three-fourths way up side of wall. Dinghy mounted directly beneath radio operator's parachute. Exits third through after end of bomb bay.

RIGHT WAIST GUNNER—Parachute mounted on starboard wall just forward of rear door and even with top of door. Dinghy mounted directly beneath parachute. Exits second through main entrance door.

LEFT WAIST GUNNER—Parachute mounted on wall immediately aft and on same level as left waist window on port side. Dinghy mounted directly beneath left waist gunner's parachute. Exits first through main entrance door.

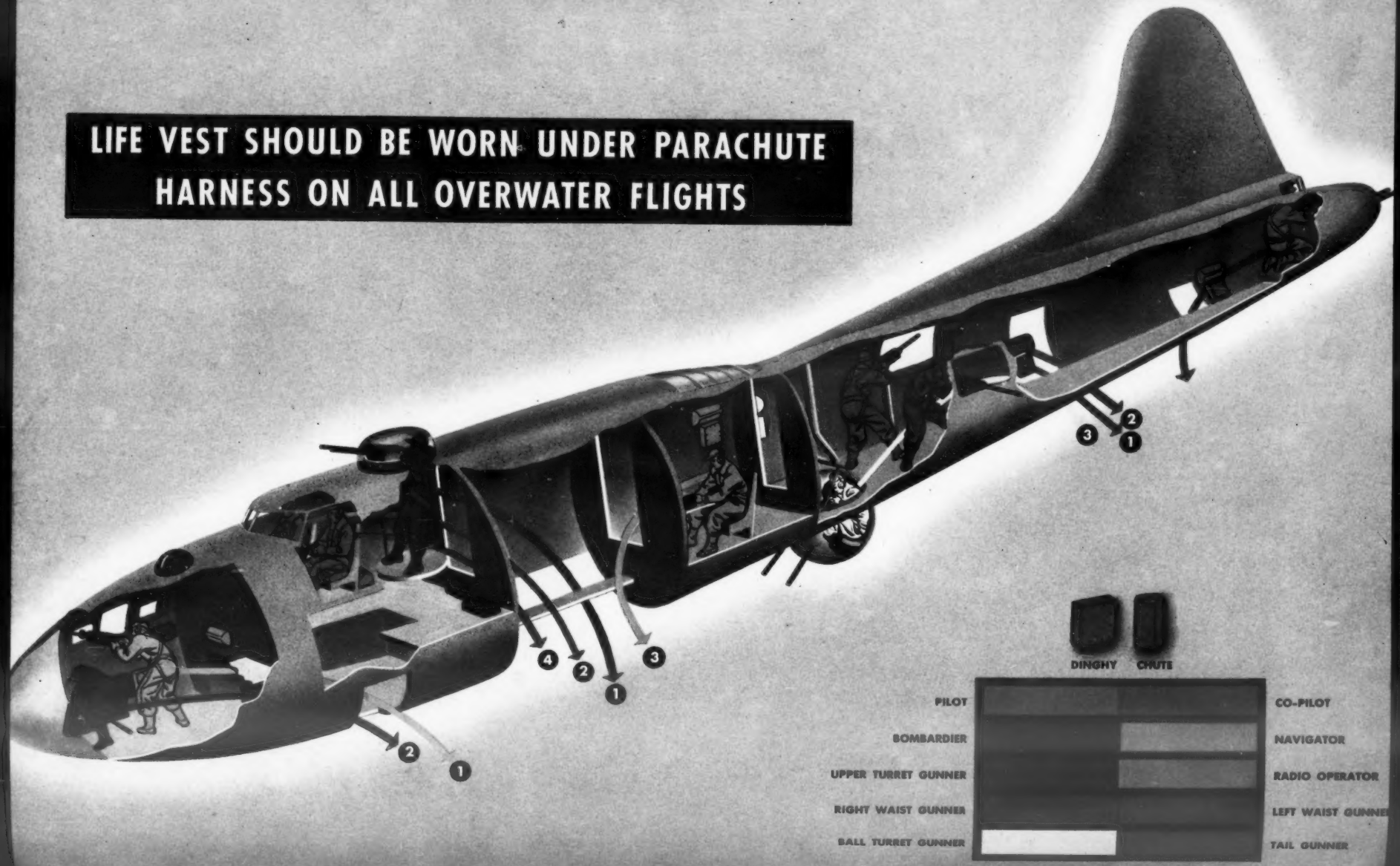
BALL TURRET GUNNER—Parachute mounted on aft starboard side of rear bulkhead of radio compartment, about even with top of door. Dinghy mounted directly beneath ball turret gunner's parachute. Exits third through main entrance.

TAIL GUNNER—Parachute mounted on starboard wall immediately aft and slightly above rear gunner's escape hatch. Dinghy mounted directly beneath parachute. Exits through small emergency door in tail.

Nothing is as important to a member of an air crew as being able to make his parachute escape from a disabled plane quickly and as safely as possible. U.S. Army Air Forces safety experts have devised a bail-out poster for every combat type of aircraft in the AAF. The one dealing with the Boeing Flying Fortress *is reproduced in color above. It, and the explanatory text below, was made available to* FLYING *by the AAF Flight Control Command, Safety Education Division, and the School of Applied Tactics.*

How To Bail Out of the Flying Fortress

LIFE VEST SHOULD BE WORN UNDER PARACHUTE
HARNESS ON ALL OVERWATER FLIGHTS



Procedure When Wearing Conventional Seat or Back-Type Parachute

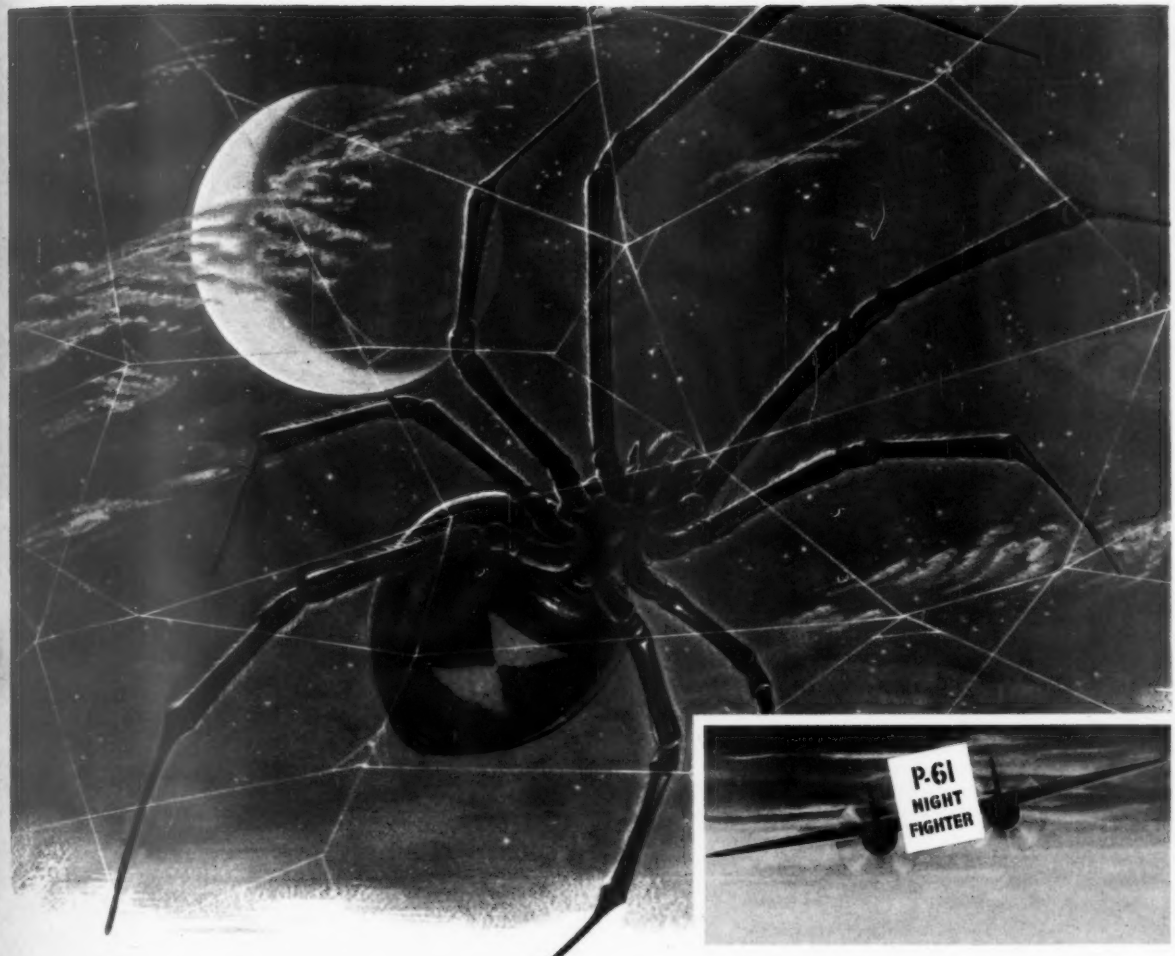
When an emergency develops in the air and it becomes necessary to bail

and speed necessary to abandon your airplane successfully and safely.

DOUGLAS DAUNTLESSES IN FINAL ASSEMBLY AT EL SEGUNDO, CALIFORNIA.

THE PILOT OF THIS LIBERATOR, BACK FROM THE SOUTH PACIFIC, ASKED AIR SERVICE COMMAND OVERHAUL BASE AT OKLAHOMA CITY TO PAINT A FEROCIOUS TIGER HEAD TO FRIGHTEN JAPS. ARTISTS ROY BREWER AND KENNETH NULL DID THIS JOB.

NAVY'S BUDD CONESTOGA (RB-1) LOADS JEEP, AMBULANCE OR CARGO THROUGH TAIL HATCH.



BLACK WIDOW *is*
the name and the general idea

The Black Widow spider is a formidable creature. It lurks in the dark . . . attacks unseen . . . cuts down its prey with poison 15 times stronger than rattlesnake venom

THE NAME "Black Widow" is a natural for the Army's new warplane, the P-61 *night fighter*.

The "Black Widow" airplane is the first designed-for-the-purpose night fighter. Its job is to attack the enemy by night. To protect air-strips and beachheads . . . to guard cities . . . to cover unloading operations. To intrude behind enemy lines and harass trains and airfields, destroy *matériel*.

The Northrop "Black Widow" is the largest, most powerful pursuit plane ever built. It has unusual speed. It can also loaf, almost hover as it hides in the night sky. Its firepower is devastating. It can take off swiftly and land slowly in the dark.

In cooperation with the Army Air Forces, the Northrop group designed the "Black Widow". You'll hear more from it . . . the deadly P-61.

NORTHROP AIRCRAFT, INC.
NORTHROP FIELD, HAWTHORNE, CALIFORNIA
MEMBER AIRCRAFT WAR PRODUCTION COUNCIL, INC.

NORTHROP

Designers and Builders of the

P-61 'Black Widow' NIGHT FIGHTER

THE NORTHROP BLACK WIDOW (P-61) NIGHT FIGHTER.

Geared for Flight!

HERE is the heart of an Aeroprop. Here are the simple components that produce the unvarying "on speed" Aeroprop performance that adds efficiency to the power and flight of many fighting airplanes.*

The Aeroprop's speed and precision of pitch control is achieved with unique simplicity. The entire assembly is self-contained and self-operated—unhampered by power lines or other accessories. Responding to powerful hydraulic pressures the blades may vary from low pitch to full feather in five seconds. Neither altitude nor temperature affect their swift automatic movement to the precise degree of pitch that produces top performance.

Equally important is the Aeroprop blade design incorporating hollow, rib-reinforced, steel construction of exceptional strength and lightness—plus the overall simplicity that makes it possible for one man to install an Aeroprop in as little as 12 minutes.

Today Aeroprops have been assigned to service on two of the most formidable fighters in the Army Air Forces. Their amazing performance on these advanced ships is a guarantee of their high contribution to the conquest of the skies.

*P-39 AIRACOBRA • P-51 MUSTANG

Aeroprop

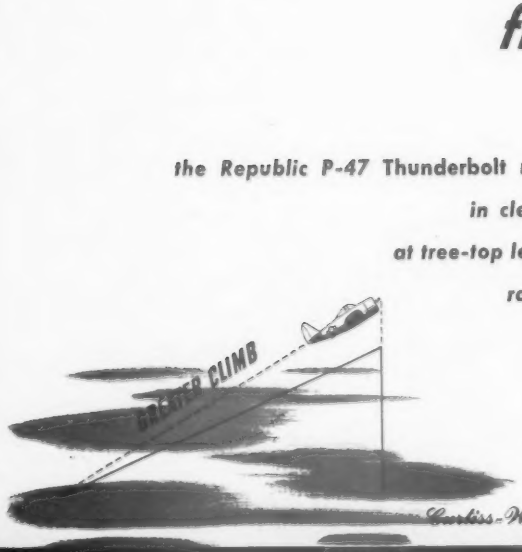
In War and Peace, Propeller Production at its Best!

AEROPRODUCTS DIVISION • GENERAL MOTORS CORPORATION • DAYTON, OHIO

GM ARMS FOR VICTORY

knockout specialist
from stratosphere to sea level

Having won a reputation as master of the stratosphere, the Republic P-47 Thunderbolt now demonstrates its power as a low-level fighter-bomber in clearing the way for invasion. After attacking without warning at tree-top levels, the Thunderbolt speedily heads skyward at a new, faster rate of climb—aided by new wider Curtiss Hollow Steel blades.



CURTISS ELECTRIC PROPELLERS

Curtiss-Wright Corporation, Propeller Division

AERIAL EAVESDROPPER

By
CHARLES CORDDRY, Jr.

Developed to improve flight instruction, magnetic wire recorder has brought back records of air battles, has many other uses in aviation.

Compact wire recorder for use in planes weighs only 12 pounds with tiny throat microphone at lower right. Recording is made magnetically on wire only 4/1000-inch thick.

☆

BATTLE noises and conversation of officers and enlisted men in the Battle for Europe may be recorded for posterity on fine wire at the rate of $10 per hour.

Some day you may hear reproduced all the sounds and conversations of the crew in an on-the-spot account of what happened in the last bomber to fly over Berlin before the white flag was hoisted. Or you may hear exactly what went on at Allied headquarters when the German surrender became known. You probably won't get a reproduction in wire of the hara-kiri ceremonies which will coincide with Tokyo's downfall—but you may, on the other hand, hear the commentary of an exuberant American as he surveys the chaotic Tokyo scene from the air.

This all will be accomplished by a compact and versatile little gadget which is capable of recording the most minute, audible details of a battle action or of a conversation.

It is called the magnetic wire recorder. It was developed under the auspices of the Civil Aeronautics Administration by Marvin Camras and brought to practical use in the Armour Research Foundation of Chicago.

Already, from published accounts, we know of the successful use to which the instrument was put on a bombing mission over Le Bourget Airfield, just outside Paris. It also was used at Salerno to record action and sounds in the vicinity of a battery of field artillery, but whether the recorder is used generally in military aircraft is not at present public information.

The wire recorder has innumerable uses. It is far superior to any other recording mechanism that could be used to study flight-instruction methods. It is unrivalled in its peculiar ability to grasp every sound occurring within a combat aircraft, thus rendering great service in the study and improvement of tactical methods.

The recorder operates on a magnetic principle. Sounds are recorded on a fine steel wire, four one-thousandths of an inch in diameter. The instrument can be had in various sizes, depending somewhat on the length of recording needed.

A tiny wire on a magnetic recorder is fed through a simple grip where electrical energy rearranges the molecules of the wire. When the wire is fed through the playback, sound is produced. Another attachment will erase the recording and the wire may be used over again.

A recorder about the size of a portable radio and weighing approximately 40 pounds will record and play back nearly seven hours of material from a spool three and three-quarter inches in diameter and one and one-quarter inches wide. Several miles of wire can be used in some instruments to make a record of an entire day's activities. The spools then can be preserved for years without appreciable effect on amplitude or frequency response.

The importance of the magnetic wire recorder is apparent from a comparison with other recorders which use steel tape and are limited in the amount of material

Plane installation of wire recorder, at left, with chin microphone. Ground recorder and playback with microphone used on ground, at right.

they can record. The difficulties of kinking also are eliminated.

From the standpoint of its value to aviation, the recorder is extremely light in weight by comparison with other such instruments. It is a great space saver and can be stowed conveniently. It eliminates vibration problems affecting other recording devices.

A single spool holds enough wire to play for six hours, whereas tape recordings are limited to a few minutes. A pound of the wire runs five miles and permits two hours of recording. The wire for an hour of sound costs about $10.

The Army and Navy are finding the device most helpful now and the Civil Aeronautics Administration has been using it with excellent results in pilot-training programs.

In October, 1942, the CAA suggested that the Navy adapt the recorder to a study of its flying instructors. It was so successful that CAA's orders for the instruments were delayed while those of both Army and Navy were being filled.

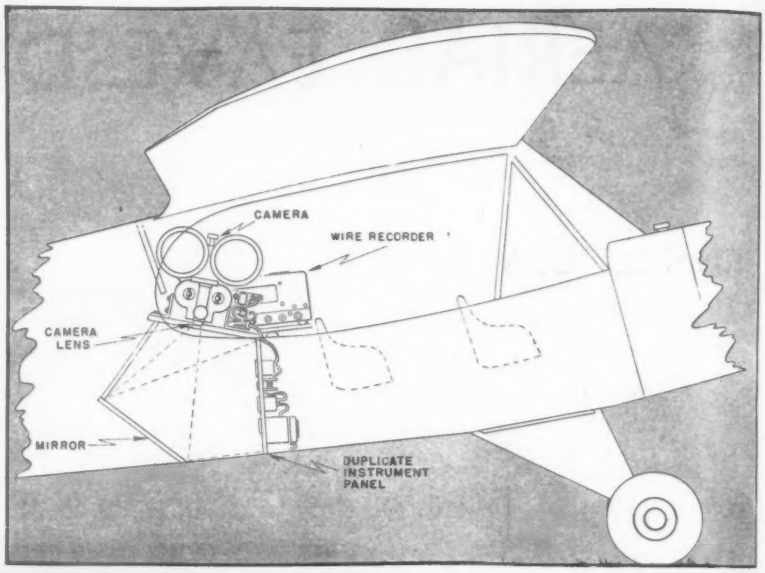
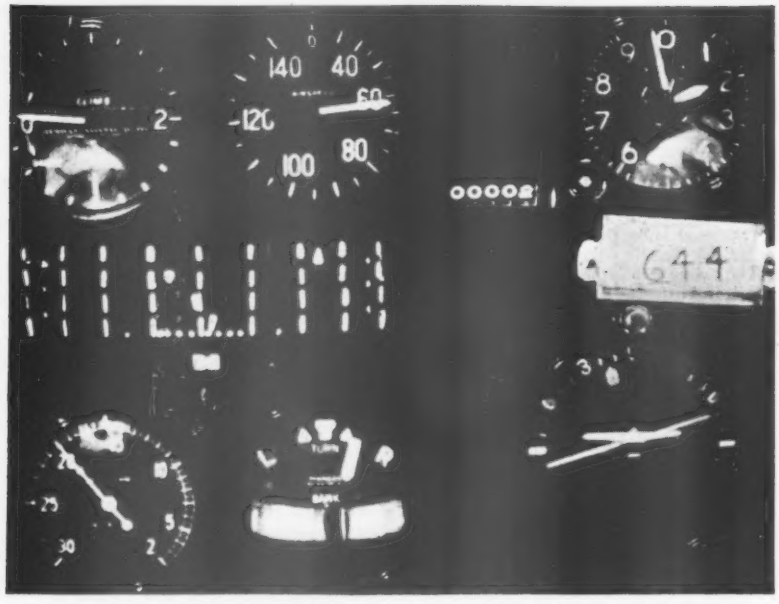


Diagram shows installation of the camera and wire recorder with duplicate instrument panel in trainer.



Typical instrument panel photo for studying student and instructor technique while in flight. These camera studies are made at same time as wire recording.

A number of other CAA experimental recorders to find out what happened when the instructor and student were aloft proved unsuccessful.

First, standard recording mechanisms were affected so much by rough air that they were useless. Then small radio transmitters were tried, with receivers and mechanical recorders on the ground. Here it was difficult to obtain enough frequencies to make a volume study.

Learning of the magnetic wire recorder, Dean R. Brimhall, CAA research director, initiated a program with the National Research Council for studying flight instruction.

The first instrument obtained for the program was installed in a training plane at a school where students were having difficulty learning to spin and to recover from spins. When the wire was played back, it was discovered that one instructor reacted to the spin in too excited a manner for the good of his students. His voice rose in pitch and volume so that his students actually were scared into incorrect maneuvers.

Often the most surprised persons at the play-back sessions were the instructors. The reproduction of their exact words and the re-creation of the atmosphere of flying and of nerve tension during their instructional periods revealed their shortcomings clearly. Thus the CAA, after a two-year search, had the machine to learn just what happened in instructional sessions and for the first time developed a scientific approach to the business of flight instruction.

Coupled with use of the wire recorder in its instructional program, the CAA studies photographs made in flight of a duplicate instrument panel which includes a special device showing the position of the rudder, flipper, ailerons and throttle simultaneously with the reading on standard instruments. From these photographs it is possible to detect mishandling of controls in standard maneuvers and to take corrective measures with either pilots or instructors.

The duplicate is installed just back of the rear seat in a tandem trainer, and the camera photographs it by means of a mirror inclined at a proper angle.

Some results of aerial eavesdropping, accomplished through use of the magnetic wire recorder, are listed below:

1. Teaching too much, too fast:

Instructor—"Now on these eights around, see, you fly between your pylons downwind, start your turn, and keep the same distance from your pylon during the turn. You'll have to shallow out when you head into the wind, and steepen the bank when you are headed downwind." etc., etc., at great length.

2. Poor instruction:

Instructor—"Now let's get into a normal glide; that's been one of your troubles. Don't pull the stick backwards and forwards. Just get your approximate speed—and check it occasionally with your air speed indicator," etc. resulting in great confusion for the trainee.

3. Good instruction:

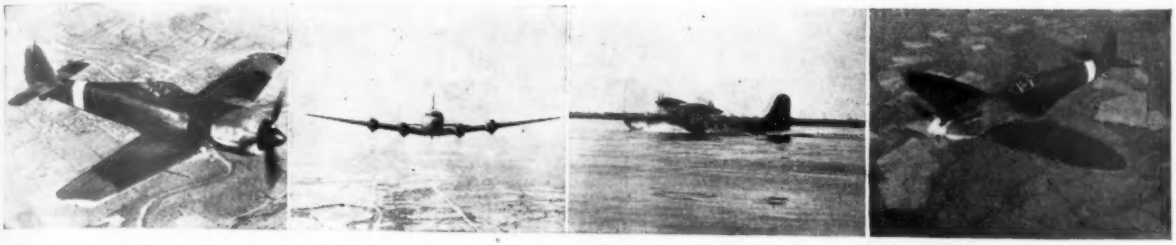
Instructor—"Do you see that paved road ahead of us there, running north and south?"

Student—"Oh yes."

Instructor—"We'll use it for our landmark, fly parallel to it, enter our turn, turn through 180°, and we'll recover flying parallel to it but headed in the opposite direction. All the time we hold our

(*Continued on page* 152)

FOR IDENTIFICATION



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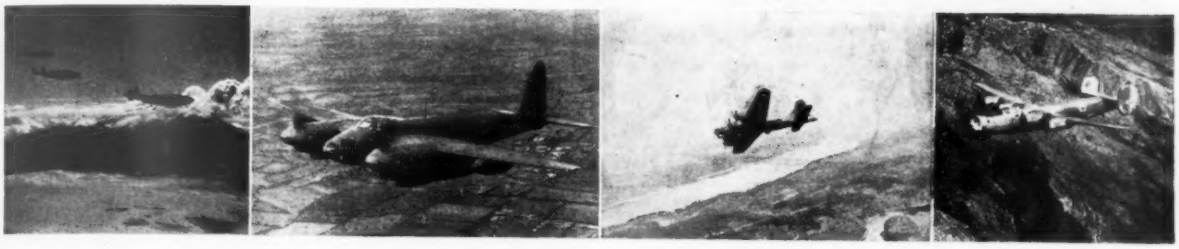

5 6 7 8

The planes are: 1. Focke-Wulf Fw-190; 2. Douglas Skymaster; 3. Navy Nomad (FRN-1); 4. Supermarine Spitfire; 5. Lockheed Ventura; 6. De Havilland Mosquito; 7. Boeing Flying Fortress; 8. Consolidated Liberator.

MISTAKEN IDENTITIES

AT a quick glance the Jap Zeke and the American Curtiss *Warhawk* look dangerously alike. On closer study, the longer nose of the *Warhawk's* liquid-cooled engine stands out in contrast to the air-cooled engine of the Jap fighter. Note similar wings.

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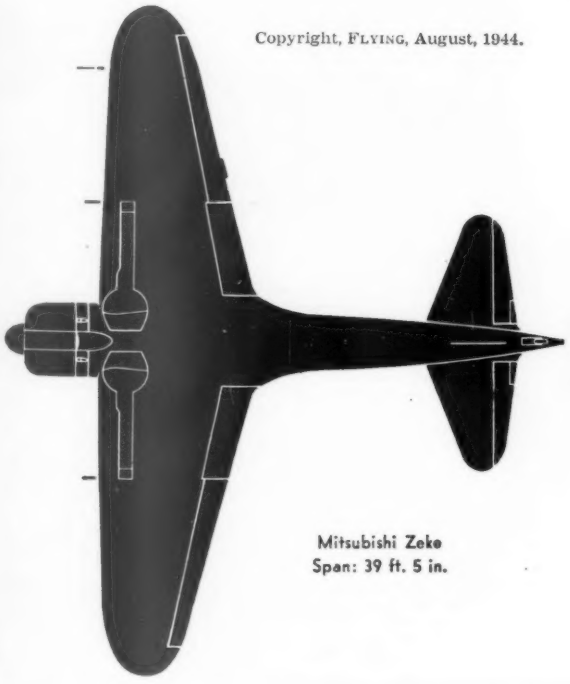
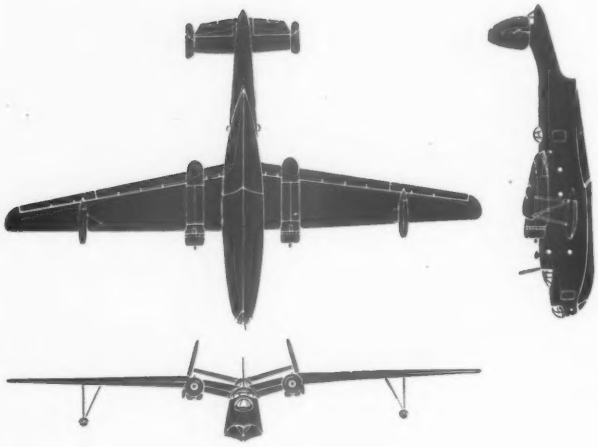


Mitsubishi Zeke
Span: 39 ft. 5 in.

Curtiss Warhawk
Span: 37 ft. 4 in.

MARTIN MARINER

Patrol Bomber



PERTINENT FACTS: One of the Navy's three types of flying boats still in use, the *Mariner* (PBM-3D) currently serves as an anti-sub patrol bomber and, converted, as a cargo plane. The two engines are 1,700-h.p. Wrights. Top speed is just over 200; cruising speed is 150 m.p.h. Maximum range is 3,000 miles; maximum gross weight is 24,000 pounds. Service ceiling is slightly over 15,000 feet. Wing span is 118 feet, wing area, 1,408 sq. ft.; length, 80 feet; height, 27 ft. 6 in. As a patrol bomber, it has a crew of nine men, eight .50-caliber machine guns and bombs carried internally in the engine nacelles. *Mariners* also are used by the Royal Australian Air Force.

WHAT TO LOOK FOR: The high gulled wing is cantilever in construction, has narrow chord, straight leading edge and tapered trailing edge. Wing tip floats are fixed and do not retract. The twin-ruddered tail has pronounced dihedral in the horizontal fin and elevator; the rudders "toe in" at the top.

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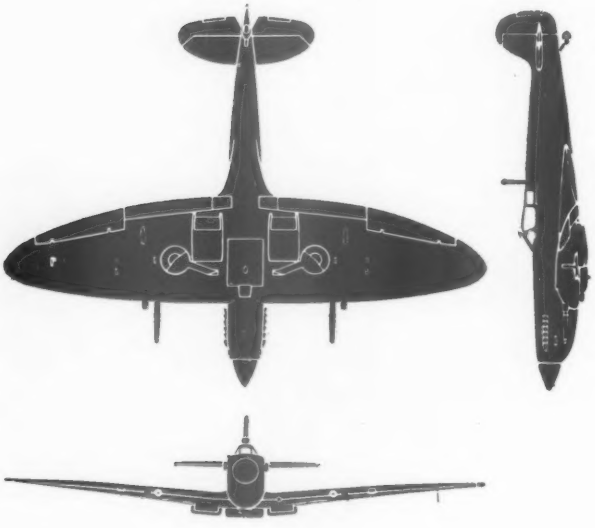
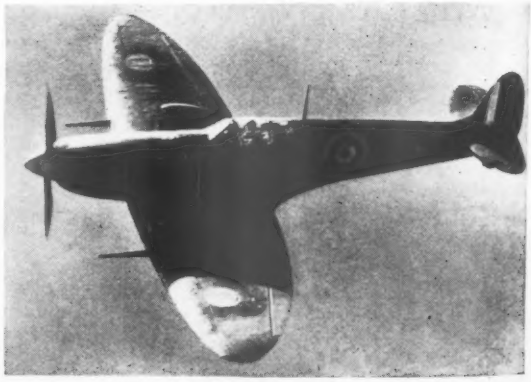
SUPERMARINE SPITFIRE IX

Fighter





PERTINENT FACTS: One of the latest versions of the famed *Spitfire* now in use, the *Spit IX* is a high-altitude interceptor with a top speed of 400 m.p.h. at 40,000 feet. The engine is the Rolls Royce *Merlin 61* of about 1,600 h.p. and it has a two-stage, two-speed supercharger and intercooler. Standard armament is two 20-mm. cannon and four .303-cal. machine guns, and there is provision in the wing for two more cannon. Wing span is 36 ft. 10 in., wing area, 242 sq. ft.; length, 31 feet; height, 11 ft. 5 in.

WHAT TO LOOK FOR: The *Spit IX* closely resembles earlier models of this fighter. The familiar elliptical wing is evident, as are the rounded tail surfaces. In the front view, however, the *Spit IX* differs from other models in that it has two rectangular radiators on the underside of the wing. When seen from this position it might be mistaken for the Messerschmitt Me-109E (see opposite page).

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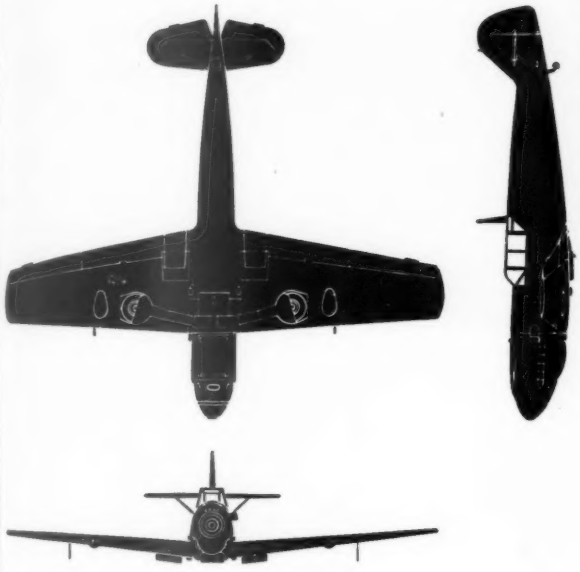
MESSERSCHMITT Me-109E

Fighter



PERTINENT FACTS: One of the oldest German fighters still in use, the Me-109E still is being reported on the Russian and Italian fronts. Me-109E's also have been reported to be carrying rockets. The currently first-line Me-109F and Me-109G are developments of the "E". This early model is powered with an 1,150-h.p. liquid-cooled Daimler-Benz engine. Top speed is 354 m.p.h. at 12,300 feet, cruising speed is 298 m.p.h. Stalling speed is 75 m.p.h. and the service ceiling is 36,000 feet. Armament is two 77-mm. machine guns on the engine cowl and two 20-mm. cannon in the wings. A 1,210-pound bomb can be carried Wing span is 30 ft. 3 in.; length, 26 ft. 8 in.; height, 7 ft. 5½ in. Gross weight is 5,520 pounds, wing loading 31.4 lbs. per sq. ft.

WHAT TO LOOK FOR: The low cantilever wing has squared-off tips, slight leading edge taper, pronounced trailing edge taper and several degrees of dihedral. Two rectangular radiators under the wing are recognition details. The "E" is identified from later models by the blunt nose and rough engine cowl, by the externally braced tail, and by the square wing tips.

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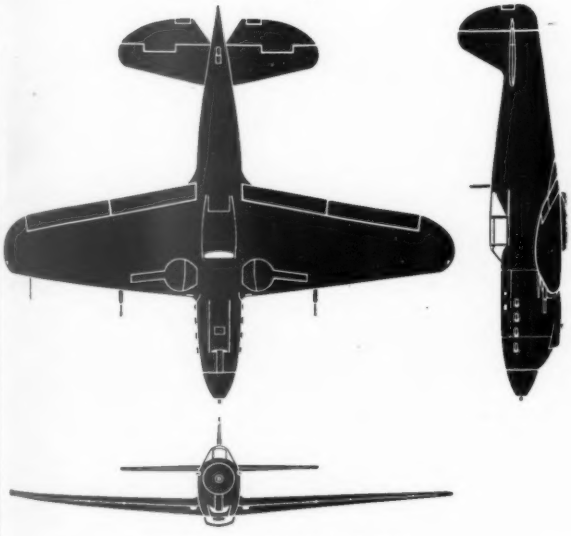
YAK-1

Fighter



PERTINENT FACTS: Few specific facts on the Yak-1—as is the case with nearly all Russian military aircraft—have been confirmed. It is understood, however, to be powered with a 1,200-h.p. liquid-cooled engine. Top speed is said to be 335 m.p.h. Armament includes a cannon firing through the propeller hub and two machine guns in the wings. Wing span is 32 ft. 10 in., length, 27 ft. 10 in.; height, 10 feet. Gross weight is about 6,000 pounds.

WHAT TO LOOK FOR: This low-wing, single-seat monoplane resembles somewhat the British Hawker *Hurricane*. The cantilever wing has equal taper and rounded tips. The fuselage, cockpit and tail unit are conventional.

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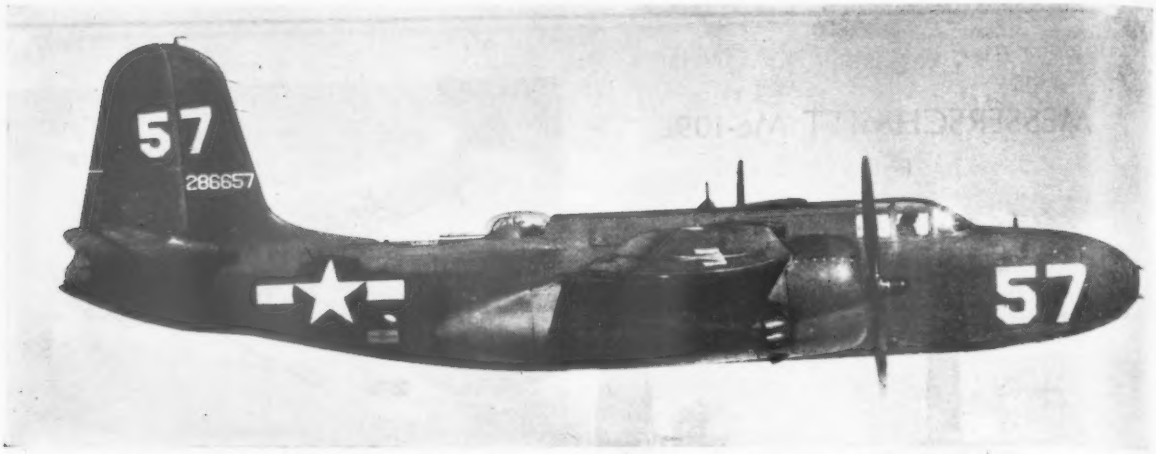
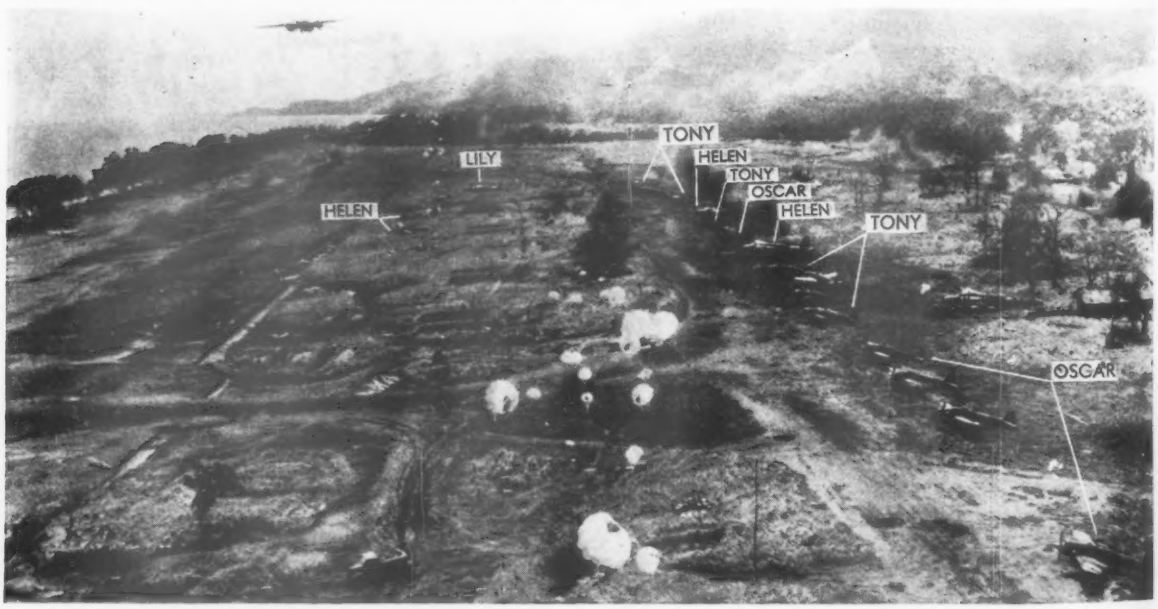


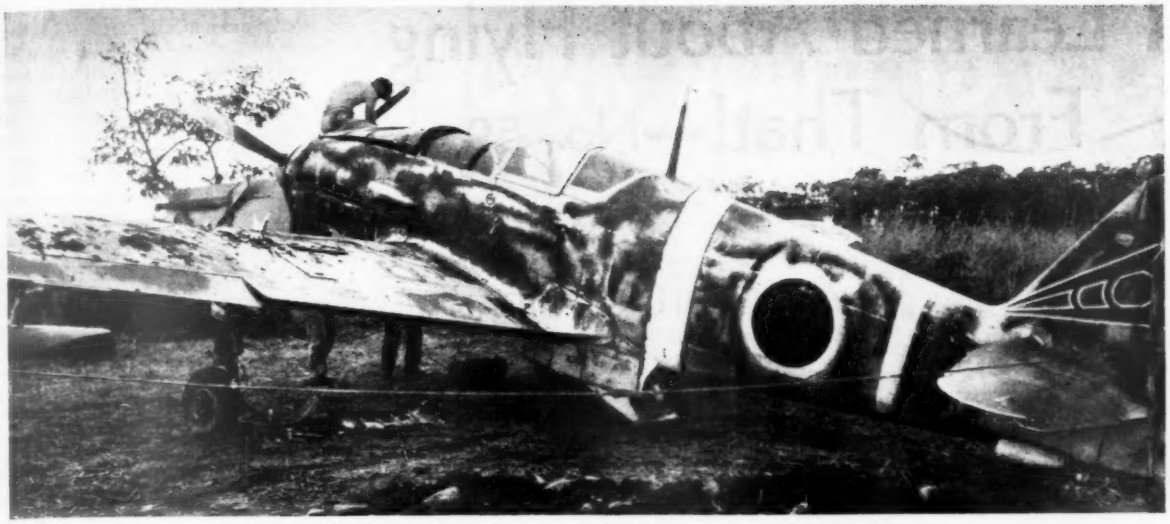
Latest modification of the Douglas Havoc has new two-gun turret on fuselage, four or more guns in the nose.

HAVE YOU SEEN?

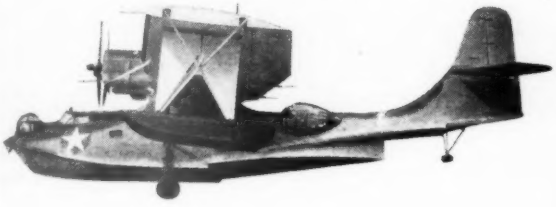
Capt. Walker Mahurin, AAF ace in England, had this interesting wide-angle rear view mirror arrangement put on his Thunderbolt to protect his tail

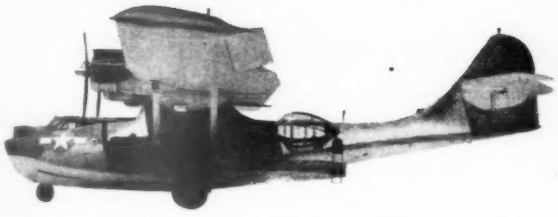


Mitchell medium bombers (one at upper left) of the Fifth Air Force parachute-bombed this Jap base at Dagua with devastating effect. Various nicknames in picture indicate the variety of Jap planes caught on the ground.

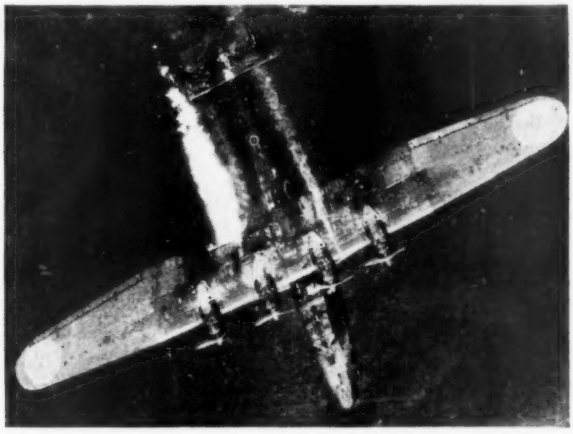


One of the newer Jap fighters is Tony (Mitsubishi S-03). Closely resembling the Italian Macchi C-202, Tony is powered with a Jap-built German Mercedes-Benz engine. Span is 39 ft. 4 in., length, 30 ft. 1 in. Top speed is 330 m.p.h. Armament includes two cannon.





Photographs above show external differences between Consolidated Catalina (bottom) and Naval Aircraft Factory version, the Nomad (PBN-1). Nomad's tail, hull, nose were redesigned.



A U. S. Navy Liberator brought back this remarkable picture of a Jap Mavis flying boat it shot down. Fierce gasoline fire has burned away part of tail. The photograph was taken near Truk.

This is one of the first photographs to be published showing the use of a catapult on an aircraft carrier's deck. Taken aboard an anchored British carrier, the picture shows a Fairey Fulmar about to be launched.

I Learned About Flying From That!—No. 59

The author has commercial pilot rating.

By

ARTURO GIGANTE

Once too often, this Puerto Rican instructor allowed his student to keep the controls until the very last minute.

☆

I WAS flight instructor for the Borinquen Flying School at the time this happened. For flight training we used one *Cub*, two Aeroncas, a Rearwin, a Travel Air, and a five-passenger Stinson with a 225-h.p. Lycoming engine. We used the latter mostly for chartered trips to Mona, Vieques, Saint Thomas, Saint Croix, and other islands in the vicinity of Puerto Rico.

I had been quite successful in instructing students and had never failed to solo any one of the hundreds that began their aerial careers with me. I attributed this success to my patience and to the risky habit of letting the students keep the controls up to the very last minute, so that they might realize to what dangers they had been led by their mistakes.

Earl L. Moore, an old hand at flying and owner of the school, argued against this habit of mine and predicted that some day I would run into trouble on account of it. However, since I had gained a good reputation as an instructor in Puerto Rico, which brought new students to the school, he let the matter ride. But in the long run it nearly brought about my untimely departure from this world.

I used to work at the school in the afternoons, during week days and all day on Sundays, beginning at nine a.m. and calling it a day at six p.m.

One Sunday afternoon I was munching a sandwich in the office when a soldier walked in and asked, "Is this the place where I can get flying instruction?"

He told me that he wished to take one or two hours. He said he had been trying to learn how to fly for a long time but that with some 40 hours of dual control instruction he was still unable to fly, because, he claimed, his lessons had been so far between. He showed me his student permit and his log-book, signed by at least five instructors in various parts of the continent, and asked me if he could buy a couple of hours on a *Cub*, as he had had all his previous instruction on a tandem plane.

We took off in the *Cub*, and when I had gained around 2,000 feet, I told him to take over the controls so I could check what he knew. He started handling the plane with the ability of an average student, flying a straight line, turning to the right, to the left, doing S's on a road, figure 8's, and all the procedure that forms the curriculum of a regular flight course.

After checking his flying ability I ordered him to land and noticed that he got nervous as soon as the plane began to glide. When I asked him what the matter was, he told me that his troubles began as soon as he was close to the ground, both in landings and take-offs.

Without paying much attention to this, I let him approach the field and try to land. He made a fair landing, except for the level off, which, like most students, he delayed until the plane hit with wheels first and bounced a couple of times. I took the controls and corrected the landing, directing the plane to the gasoline pump, as I had noticed that we were running short of gas.

When I cut the engine he looked a little disappointed, thinking I was going to call it a day. His smile returned, however, when I explained that we were merely refueling and that the time we were on the ground did not count against his hour.

I took the *Cub* back to the starting line, as I had noticed that my student knew the procedure of a regular take-off. I decided I would use a little psychology and give him much-needed confidence in himself by telling him, "Well, mister, here is where your troubles really begin, I am going to let you take off without my help. Do you think you can?"

He nodded nervously, gave the engine the gun and "revved" it on the ground, testing each "mag." After warming it enough, he gave it the full gun and began to run over the field, using almost its whole length for the take-off, though he could have become airborne in about one fourth that distance.

I let that pass, blaming it on his nervousness. When he lifted the *Cub* off the ground by pulling the stick back, the little plane literally jumped off, and started climbing like a helicopter because of its excessive momentum. However, he kept the stick back and pretty soon the plane started to mush instead of climb and lost its forward speed and climbing power.

A *Cub* trainer, because of its large wing surface and light weight, will stand much abuse without stalling. However, finally I thought it was time for me to interfere, so I took hold of the stick and told the student, "let me handle it. I will show you your errors in taking off." As the plane was almost stalled I nosed her down to gather some much-needed flying speed.

We were about 400 feet up by this time and when I nosed her down, the plane apparently was headed straight for some trees up ahead and began to gather flying speed again. My student, thinking I was going to hit the trees, grabbed the controls and pulled the stick all the way back, freezing the controls and almost causing a whip-stall. Right then and there my policy of letting the student ride to the end of his rope almost proved fatal.

I tried with all my effort to regain control of the plane again, but the student was frozen onto the controls. He refused all my advice, efforts, and orders to let me gain possession of the controls. Meanwhile the plane started falling in an erratic nose-dive. While going straight down, it flapped every now and then to one side or the other, while I tried with all my powers to push the stick forward. I failed because of its position in relation to the front seat of the *Cub*, and because my student seemed to have superhuman strength under the influence of his fear. I began to believe that this was probably my last adventure in aerobatics.

Losing all hope of regaining control of the plane by convincing the student, I decided to knock him out by hitting him on the head with the fire extinguisher, which was attached to the cabin floor near my feet. As I bent down to get it, I suddenly remembered that that same morning I had scolded the hangar help for not cleaning and taking proper care of the planes, and had showed them that same fire extinguisher as an example, because it was leaking from wrong handling by a student. So, when my hand

(*Continued on page* 160)

IS *Your* TOWN READY TO FLY?

Inexpensive "T" Landing Strip on Edge of Town, Illustrated

To take full advantage of the coming air age, your town must be ready to fly the minute Victory is won! It must follow the lead of thousands of other progressive towns and plan landing facilities now.

An inexpensive landing strip or airport will offer you and your fellow-townsmen the new pleasure and convenience of private flying, and afford connection with main airlines. In addition, it will make your town more progressive, increase business opportunities and swell civic activity.

The new booklet, "What Your Town Needs for the Coming Air Age", will help you and your town officials in laying practical plans. It gives the why, where and how of building landing facilities. Write for your free copy now. Piper Aircraft Corporation, Dept, PA84W, Lock Haven, Penna.

GET YOUR AVIATION BOOKLET—"Piper Cub . . . In War and In Peace." Full color, 32 pages. Covers history of light plane, Piper Cub planes, coming air age, how to fly. Enclose 10c in stamps or coin for postage-handling. Write Piper Aircraft Corporation, Department PA84, Lock Haven, Pennsylvania.

16mm. SOUND FILM—"The Construction of a Light Airplane." For distribution points write: Supervisor, Audio-Visual Aids, Extension Services, Pennsylvania State College, State College, Pennsylvania.

PIPER *Cub*

Points the Way to Wings for All Americans

Invasion by Air

(*Continued from page 23*)

due to German antiaircraft fire, not the Luftwaffe. Only German bombers reported at this writing were seven Junkers Ju-88's and four Heinkel He-177's, all shot down within a few seconds after being sighted.

The Germans, meanwhile, alibied that their poor showing was due to the bad flying weather. The weather *was* bad; bombers, fighters and transports were operating as low as 100 feet above ground. It was the low cloud layer and the fact that Allied officers elected to fly below the clouds, that enabled German gunners on the ground to shoot down as many invading aircraft as they did.

Nearly every current British and American type of combat aircraft took part in the initial air operations. One American pilot said you had to put out your hand before making a turn; a number of pilots agreed that the danger of colliding with one another was far greater than any hazard presented by the German air force. The following summary deals with the basic aircraft categories, specific types, and the kind of operations they performed during the first days of the invasion.

BOMBERS. American heavies were the Boeing *Flying Fortress* and Consolidated *Liberator*. British heavies were the Avro *Lancaster I, II and III;* Handley Page *Halifax* and Short *Stirling*. American mediums were the Martin *Marauder* and North American *Mitchell;* British mediums were the DeHavilland *Mosquito*, Vickers *Wellington*, Armstrong-Whitworth *Whitley* and the American-built *Mitchell*. Both the British and Americans used versions of the Douglas *Havoc* light bomber.

More than 1,000 RAF heavies—*Lancasters* and *Halifaxes*—launched the invasion operations the night before D-Day by hitting enemy land batteries on the French coast with tremendous loads of high explosives. These bombers demonstrated their versatility by flying in at 1,000 feet in the dark, dropping their giant blockbusters on enemy installations, then diving down to drop lighter bombs as low as 100 feet above ground. RAF Pathfinders did an excellent job of locating and marking the targets for the big bombers. After dropping their bombs, the night-flying giants flew back and forth over the enemy, strafing with their machine guns. This particular operation is all the more unusual because of the fact that bombers of this type have always operated in the vicinity of 20,000 feet. In another instance, a force of nearly 500 of these night-flying giants bombed an enemy fuel dump in a forest from 1,000 feet, then dove down to shoot up the area. All Allied losses in these operations were due to antiaircraft. American *Forts* and *Liberators* carried on the operations against land batteries from higher altitudes during the day.

The majority of medium bombers used were *Marauders*. They bombed and strafed from low altitude, concentrating on enemy ground defenses and communication lines. Most of the *Mitchells* reported were those operated by the British; as this issue went to press there had been no announcement of the use of the newest version of the *Mitchell* with 14 .50-caliber guns and one 75-mm. cannon. This *Mitchell* could be extremely effective against coastal batteries and tanks. *Mitchells, Marauders* and the light *Havocs* all did an exceptionally effective job of keeping enemy air bases inactive.

All bombers in all categories carried extremely heavy loads of bombs over their targets. The short distances between their bases and targets enabled them to operate with small loads of gasoline.

FIGHTERS. Both AAF and RAF fighters proved themselves the most versatile of all combat types. Nearly every type operated by both air forces did particularly well at dive bombing, skip bombing and strafing.

American fighters participating in the operations were the Republic *Thunderbolt,* North American *Mustang* and Lockheed *Lightning*. At this writing the new Northrop *Black Widow* night fighter was not known to have participated in the invasion. British fighters used were the several current models of the famed Supermarine *Spitfire,* the Hawker *Typhoon,* DeHavilland *Mosquito,* Bristol *Beaufighter* and the newly announced Hawker *Tempest*.

Thunderbolts and *Mustangs* did particularly well at dive-bombing gun emplacements and stockpiles of supplies. One small group of *Thunderbolts* caught a German armored road convoy of about 100 vehicles rushing reinforcements to the invasion coast. The *Thunderbolts* destroyed half of the convoy. A *Mustang* squadron found a group of tanks hiding beside a road. They knocked out five and damaged 15. Another group of *Mustangs* destroyed five highway bridges within a few minutes, cutting off German reinforcements that were rushing north. Another *Mustang* group caught a German oil tank car train and blew up each of the train's 26 cars.

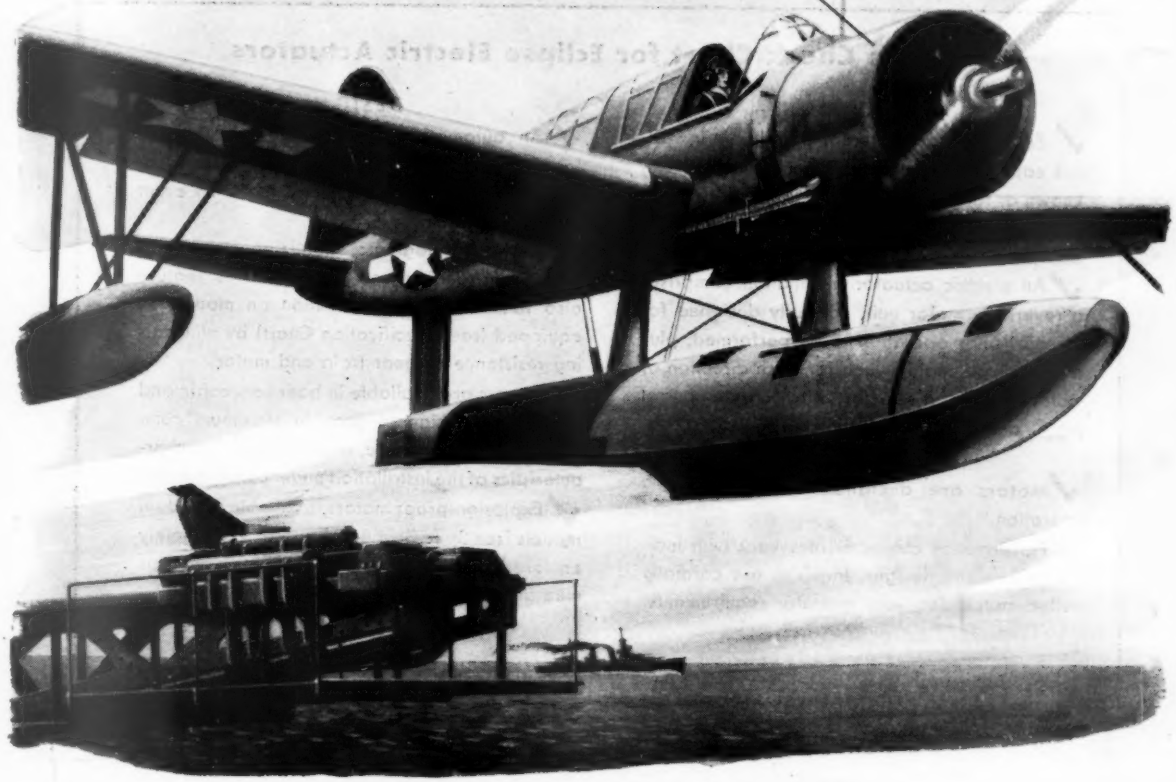
Lightnings, meanwhile, were lugging two 1,000-pound bombs each against the enemy. One group of *Lightnings* wiped out a German military headquarters with their bombs. British *Typhoons,* armed with rockets as well as their four cannon, blew up an ammunition train. Rocket-firing *Beaufighters* also were in action. Another group of British fighters spotted a German staff car on a road, escorted by two tanks and an armored car. As they dove to the attack, the vehicles stopped in front of a chateau and the occupants of the staff car ran into the building. The pilots then skipped their bombs into the front door, blowing up the entire building.

All of these fighter operations were in

(*Continued on page 146*)

"He comes in handy explaining formation flying!"

WHERE PERFORMANCE REALLY COUNTS...



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Full throttle, the jarring, explosive push of the giant catapult, and a Navy scout plane is airborne to search the seas ahead for lurking submarine or other enemy craft. In the few seconds after launching, the plane actually drops slightly, then the full power of the engine takes hold. This is no place for spark plug failure. Dependable Champion Spark Plugs, true to their more than thirty-year-old heritage, are designed to meet extreme as well as normal service. The records of our armed forces in the air, on the land and on the sea provide dramatic daily evidence that where performance really counts, you can count on dependable Champion Spark Plugs. Champion Spark Plug Company, Toledo 1, Ohio; Windsor, Canada; Feltham, England.

BUY WAR BONDS MORE THAN BEFORE

C-26—Unshielded

INSTALL CHAMPIONS AND FLY WITH CONFIDENCE

Electric

Provide Torque for Retraction of Landing Gear, Operation

Design Check Chart for Eclipse Electric Actuators

APPLICATION

✔ Eclipse Electric Actuators, available in various capacities, provide the mechanical muscle, known as torque, for retraction of aircraft landing gear, operation of bomb bay doors, wing flaps, and similar applications.

✔ An electric actuator installation comprises a reversible motor unit, specially designed for the particular operation to be performed, plus a suitable solenoid switch for each direction of motor rotation, a selector switch on the control panel, and suitable limit switches.

PERFORMANCE

✔ Motors are designed for 24-volt DC operation.

✔ Performance characteristics vary with individual airplane designs. Inquiries are cordially invited concerning your actuator requirements.

DESIGN

✔ An automatic, compensating torque limiting device, in the form of a multiple disc clutch, protects reduction gearing and motor in event of undue loading.

✔ A special magnetic equalizing clutch prevents over-running and jamming. This feature also facilitates hand operation on models so equipped (see Specification Chart) by eliminating resistance of gear train and motor.

✔ Motors are available in both concentric and right-angle design to provide maximum compactness and clearance, depending on the characteristics of the installation under consideration.

✔ Explosion-proof motors, available in certain models (see Specification Chart), are completely enclosed against explosive vapors, as well as mud and dirt.

"Eclipse" is a Trade Mark of Bendix Aviation Corporation

SPECIFICATION CHART ECLIPSE ELECTRIC ACTUATORS

Eclipse Designation (Type)	Present Application	Wiring Connection	Clutch Setting Lb. Ft.	Design	Hand Crank	Explosion Proof	Weight Lbs.
1061-2	Landing Gear	Disconnect Plug	375	Concentric	No	Yes	35.0
1063-2	Wing Flap	Disconnect Plug	125	Concentric	Yes	Yes	30.75
1073-1	Bomb Door	Terminals	100	Right Angle	No	No	21.0
1073-2	Landing Gear	Terminals	100	Right Angle	Yes	No	22.75
1065-1	Nosewheel Door	Disconnect Plug	100	Concentric	No	Yes	28.5
1064-2	Bomb Door	Disconnect Plug	62.5	Concentric	No	Yes	28.5
786-1	Wing Flap	Terminals	50	Concentric	No	No	18.0
1227-1	Tail Wheel	Terminals	33	Right Angle	Yes	No	19.25

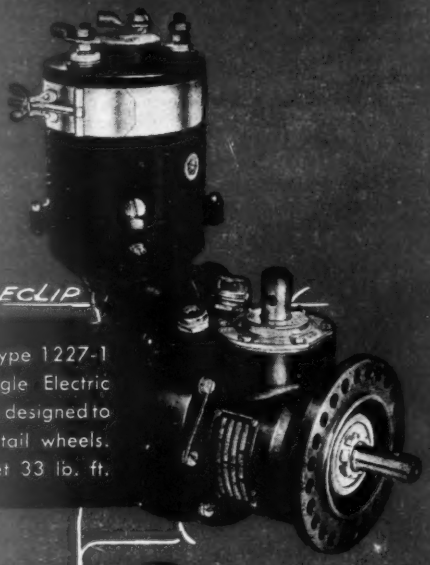
Mounting: All the units with the exception of Type 1061-2 have the following mounting characteristics: Flange Diameter $4\frac{15}{16}$"; Pilot diameter 2.997"; Number of holes, 24; Hole diameter $\frac{21}{64}$"; Bolt circle diameter 4". Type 1061-2 has 6" flange; Pilot diameter 3.997"; 6 $\frac{13}{32}$" mounting holes, and Bolt circle diameter $5\frac{1}{4}$".

Eclipse AVIATION

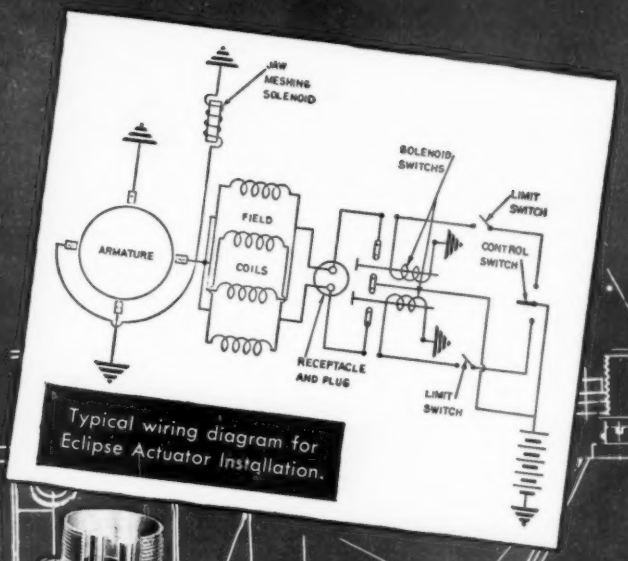
Eclipse-Pioneer Division

Actuators

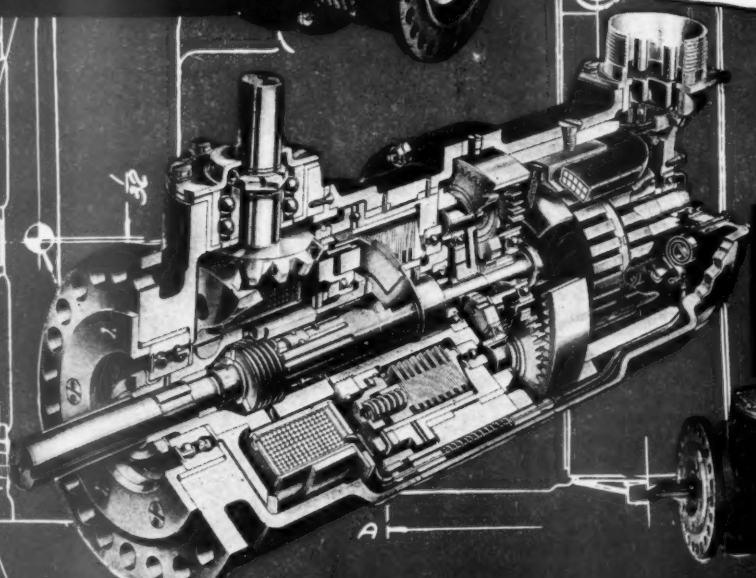
of Bomb Bay Doors, Flaps, and other functions



Eclipse Type 1227-1 Right-Angle Electric Actuator, designed to operate tail wheels. Clutch set 33 lb. ft.



Typical wiring diagram for Eclipse Actuator Installation.



Eclipse Type 1063-2 Concentric Electric Actuator, designed to operate wing flaps. Clutch set 125 lb. ft.

RELUBRICATION CAUTION PLATE

ACCESSORIES

THE INVISIBLE CREW
Precision Equipment by Bendix Aviation Corporation

Teterboro, N. J.—Los Angeles 36, Cal.

Letters

WASPS AGAIN

Sirs:

I read with great interest the letter "What's Cooking," written by Don McGough in the June issue of FLYING.

There are a great number of civilian pilots roaming the country looking for any sort of flying jobs, but everywhere you go it is the same story, "No openings." There are many of us who have had Government flight training and have been turned loose to be hooked by the draft. . . .

At the present there are some 7,000 pilots on the loose just waiting for a chance to enter the ATC or some similar branch of the Air Forces. Yet the requirements are so high that only a few of the lucky ones are able to enter the ATC. Women are being trained at Sweetwater, Tex., with an entrance requirement of 35 hours. Yet a male pilot isn't allowed to enter the Ferry Command with less than 1,000 hours. . . .

We all would like to know "What the hell *is* cooking." This is by no means a problem that will be easily forgotten.

ROBERT G. NEKON

Glendale, Calif.

Sirs:

I started flying in 1929 at $25 an hour and have flown everything from the 25-h.p. Heath *Parasol* to the old Ford trimotor and Douglas DC-3. I personally hit all the branches of the service. Everywhere it was the same . . . "Sorry son, we can't use you. . . ."

While this was going on, one of the girls in the stockroom took a three-week's leave and got in 35 hours in *Cubs* and shortly after I was finally turned down by the ATC, she left for Sweetwater, Tex., and Avenger Field for advanced training as a WASP.

LEROY WILSON

Burbank, Calif.

Sirs:

. . . I'm not griping about the girls for taking the opportunity offered. But maybe something can be done about it. Let's hope it happens before it's too late . . . for I know what commercial pilots are in for when they get into this Army.

PVT. CHARLES F. HEPPLER
476th Bomb. Sq. (M) AAF

Barksdale Field, La.

Sirs:

. . . Practically every other branch of our armed forces has a women's auxiliary, why shouldn't the Air Forces have one too? . . .

Gen. H. H. Arnold has lauded the worth of the organization before a House Military Committee, testifying that the women are good flyers and that he plans to send all male pilots to fight, and the committee has approved military status for the WASP.

Much ridicule has been made of the statement by one of the WASP leaders that such training would make women better mothers. *Any* job that requires alertness, quick thinking, fitness, a sense of responsibility, etc., improves the mind and body of any human. In the case of a woman, such improvement tends to make her a better mother, just as military training improves a man physically and mentally and thereby tends to make him a better father. . . .

Women are accepted for training with a required minimum of 35 hours. Inexperienced? Yes, but they can claim to be of acceptable age and physically qualified—more than the major part of the erstwhile CAA-WTS pilots can profess to be. . . .

They think it's a crime that the Table of Organization decrees that they be a buck private earning $50 a month. Isn't it a pity that everyone can't fight and earn a great deal of money at the same time? . . .

The WASP at present is not a large organization, but from the start it has shown high quality and the ability to do a job here so that men may be released for foreign duty. . . .

Give the girls a chance. . . .

MRS. LA VERNE ZEMMEL

Memphis, Tenn.

THE FORGOTTEN PILOT

Sirs:

I have just finished reading a letter by "A Forgotten Pilot" in the June issue of FLYING.

Obviously, the "forgotten pilot" feels he was given a raw deal, but I'd like to straighten out a few things.

I seriously doubt if he was refused the opportunity to fly for the armed services for such reasons put forth in his letter. For one thing, college is not a requisite and hasn't been for some time. Since when did an individual need money to fly for the services? As for being overage, that requirement has been made by men whose business it is to know the best age range for military pilots derived from extensive research. As for big shot pull or backing—that's a laugh.

A lot of "young punks fresh from college" passed a competitive examination open to everyone within the age limits. We passed a rugged physical exam and began our training. We lost a lot of boys throughout the training, so that only the best would receive their wings.

When we put on our uniforms no one gave a damn what our education was, no one needed "pull." What we received in our training was the result of our ability to absorb it, and we were all treated alike. Many of our boys had no college, and I personally had a scant six months.

Allright, so our "forgotten pilot" has worked for his flying time. How in hell does he think *we* learned?

. . . If our "forgotten pilot" isn't flying this war, he either missed the boat or isn't qualified. . . .

A/C VERNON R. PETERSON

Eagle Pass, Tex.

Sirs:

. . . Of course this "forgotten pilot" doesn't state why he couldn't get into flying. There are many reasons why the services can't accept these "best damned pilots." But none of them include the reason of a college education, a rich dad or a pull. . . .

There are damned few of the boys flying over Berlin and the South Pacific who went to college or were born with that silver spoon.

If his methods of flying are so good, then the Government has certainly taken the wrong road quite a way back. Maybe if we were trained only on Sunday we would be as good as the forgotten pilots.

LIEUT. (j.g.) W. LEE CAMPBELL, USNR
U. S. Naval Air Station

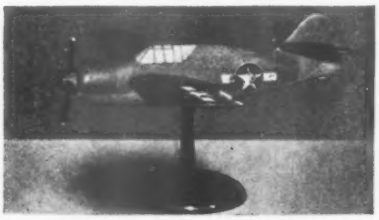
Norman, Okla.

INSULT

Sirs:

In the June issue of FLYING you have a photo of a model on the desk of the president of Lawrance Aeronautical Corporation and state "it resembles *Helldiver*."

That was an outright insult to the entire engineering department of the Brewster Aeronautical Corporation. There is no resemblance between the model and the Curtiss *Helldiver*.



Brewster experimental design.

Curtiss Helldiver.

The *Helldiver* is a twin seater, this is a single seater.

The *Helldiver* tail is not as high as this one and does not have the dihedral.

The *Helldiver* fuselage is nowhere near as deep as the fuselage of this model.

The *Helldiver* has a three-bladed prop, while this has four blades. . . .

The photograph is that of a model of an experimental airplane designed and built by the Brewster Aeronautical Corporation for the U. S. Army. . . .

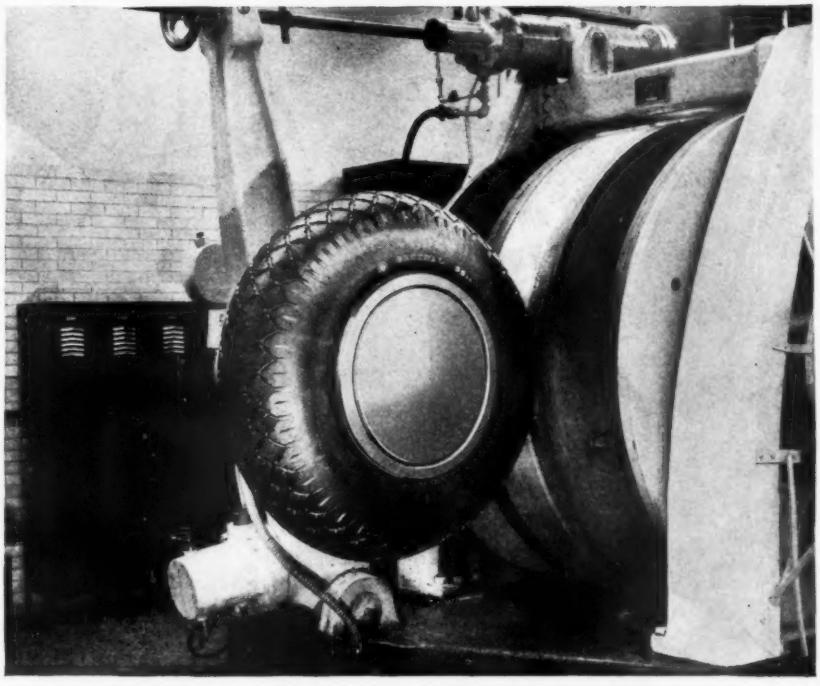
(Name deleted by request)

Hatboro, Pa.

. . . *and in* SYNTHETICS *it's* GENERAL *for* TOP-QUALITY!

WHAT HAPPENS AFTER REPEATED LANDINGS?

. . . to the beads, the tread, the cords? General 56″ synthetic-nylon, static conductor, smooth contour tire, here is shown mounted on a huge dynamometer. Any potential weaknesses arising from rolling and braking loads are discovered as the mounted tire is "landed" —again and again—on the flywheel whose surface speed approximates aircraft landing speeds. Today's synthetic-nylon General passed the test for *extreme landing speeds* with flying colors . . . just as it passed many similar rigid laboratory tests covering every phase of service conditions.



General Synthetic-Nylon Aircraft Tires Meet and Better General's Rigid Performance Standards!

Tested in conjunction with the Army Air Forces, General's special compound of synthetic rubber has proved its excellent wearing qualities, in rigid service tests as well as rigid laboratory tests.

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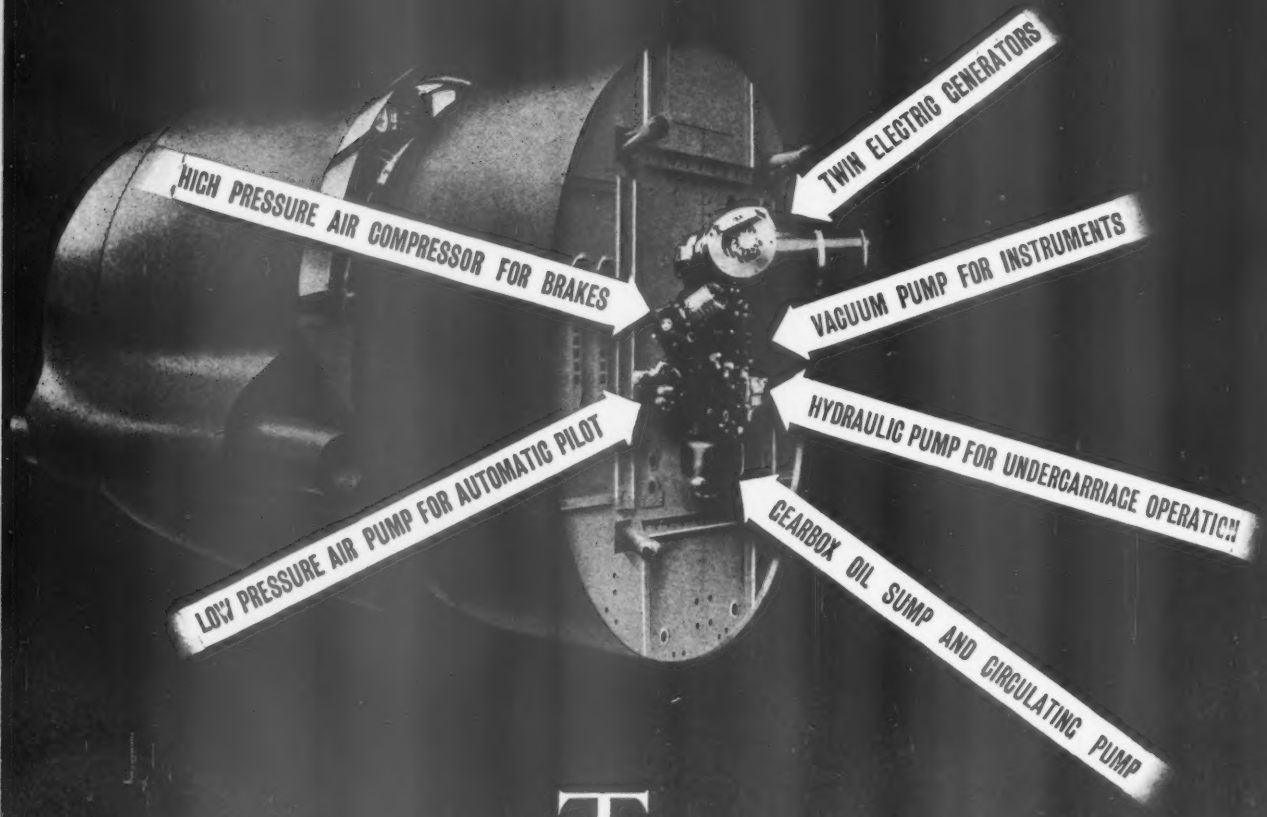
Regardless of new materials or service requirements, you can depend on this: General Tire will continue to set the standard for *Top-Quality* in airplane tire design.

★ ★ ★

General's synthetic construction is available with nylon or rayon for tail-wheel tires as well as main landing gear tires.

Aviation Division: THE GENERAL TIRE & RUBBER COMPANY, Akron, Ohio

ACCESSIBLE ACCESSORIES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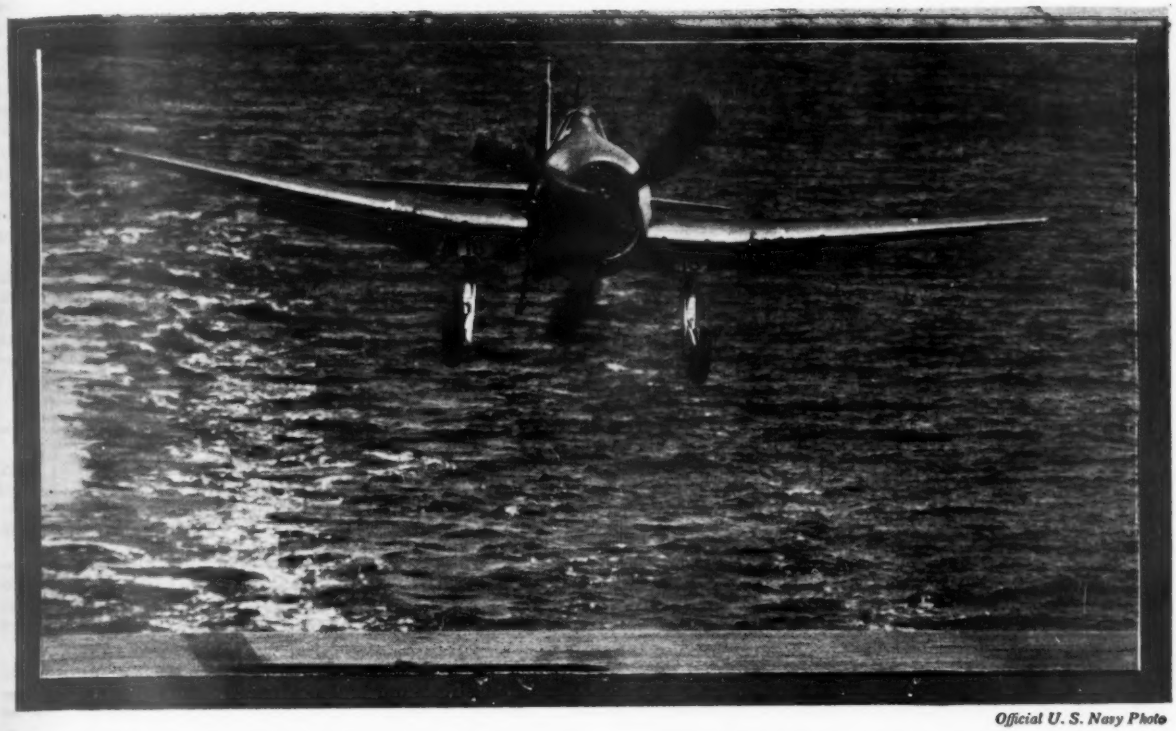

Official U. S. Navy Photo

Fighting Tires

WHEN a Grumman Hellcat smacks the deck, tires take the impact first. That's where lighter, stronger U.S. Royal Airplane Tires show their fighting strength. They're light—to cut down every ounce of unnecessary weight. They're strong—to stand up under landings on pitching carrier decks.

And on the Douglas Dauntless Dive Bomber, U.S. Royals carry the heavy bomb load, help make take-offs and landings safer.

For every kind of service—for nose wheels, tail wheels, landing wheels and beaching gear, there is a U.S. Royal Airplane Tire and Tube engineered to do the job—lighter, stronger tires to carry the heavier loads of today's fighting planes. They are fighting tires.

Official U. S. Navy Photo

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THE LIBRARY

WINGS AFTER WAR, by S. Paul Johnston; published by Duell, Sloan and Pearce, Inc., New York, in 1944. 129 pp. Price $2.

To halt the flood of wishful thinking for immediate post-war aviation possibilities, the author views the industry as a whole from a practical standpoint and points out that while aviation does have a tremendous future, there are still many problems to be solved before some of the things that have been predicted will come to pass.

The new planes will operate on the same basic principle as their pre-war prototypes and will probably cost about as much initially and to maintain. While paying tribute to the pioneering work of Igor Sikorsky for his helicopter development work, the author quotes Grover Loening's thoughts on the subject: "The helicopter at present, and for many years to come, is hard to fly—requires the coordination of five controls—and for that reason is far less suitable for the use of the ordinary layman than is the airplane.

The development likely to take first place in aviation's first post-war decade is in our domestic airlines. Its future, however, depends on the ability of its operators to offer safe, comfortable and convenient services at prices that large groups of people can afford. The hurdles that loom now are described as "economic." No flying wings, jet-propelled, or rocket aircraft are likely to be out of experimental stages prior to 1950 as far as commercial operation is concerned.

While aviation is admittedly one of the largest industries today, it has been kept alive for the past 20 years largely by and for the armed services. Its future existence depends upon the policies adopted by Government with regard to the disposition of huge post-war surpluses and the maintenance of an adequate air force in peacetime. In the author's opinion, production of U. S. military aircraft will drop to a shockingly low level in the first post-war year, then gradually build up to a figure that represents a normal peacetime replacement for the standing air forces.

This book is a welcome relief from the dribble being fed to the public by advertising copy writers and Sunday supplement cartoonists. Far from "debunking" possibilities in the aircraft field, based on sound engineering research, the future of the industry is held to be great. Onlookers, however, must be patient and wild hopes—immediate hopes—be squelched once and for all.—WILLIAM V. HUMPHREY.

BOMBERS ACROSS, by Captain Edgar J. Wynn; published by E. P. Dutton and Company, Inc., in 1944. 178 pp. Price $2.50.

"Bombers Across" is the story of men who fly the "big stuff." Much has been written about the experiences of fighter and bomber pilots, but those of the ferry pilots are little known. Captain Wynn has flown since 1941 with the Royal Air Force Ferry Command, Pan American Air Ferries, Transcontinental and Western Air and the U.S. Army Air Forces. He tells his story from the day he first became interested in flying to the end of his last ferrying mission.

One understands, after reading the book, why Wynn feels there is not a more courageous, highly specialized group of flyers anywhere. While the airline pilot flies with all the aids of modern aviation, the ferry pilot must often fly over uncharted territory, headed for a small airfield he has never seen before, without the help of weather data, beacons or radio aids. He must have an excellent working knowledge of navigation, meteorology, airplanes, engines and a thousand other details which mean the difference between cracking up in mountains or jungle or getting the much-needed bomber to its destination.

"Bombers Across" is a valuable addition to every bookshelf—both as an exciting, non-combat war story and as a personalized, factual account of the work done by the men who fly them over.—LYNN H. SLIFE.

"He says jet propulsion is old stuff!"

FLYING

SHORT VIEWS

AIRPLANE ENGINE MECHANICS QUESTIONS AND ANSWERS, by Rolla Hubbard and Augustin Dilworth. Published by McGraw-Hill Book Company in 1944. 260 pp. Price $3.

A manual for mechanics, pilots and machinists designed to supply up-to-date information of the type that will confront the mechanic taking a CAA examination for engine license.

FLIGHT ABOVE CLOUD, by John Pudney; published by Harper & Brothers, New York in 1944. 54 pp. Price $2.

A book of unusual war poems, written by a squadron leader in the RAF The thoughts of fighting pilots are expressed with a deep understanding and are reminiscent of the prose-poetry of Antoine de St. Exupéry.

CELESTIAL NAVIGATION, by Walter Hadel. Published by McGraw-Hill Book Company in 1944. 261 pp. plus supplement. Price $3.25.

A problem manual in which the reader is taken on imaginary navigation flights in which he determines the position of the aircraft by means of celestial fixes. Less emphasis upon theory than upon problems.

LONG RANGE FLIGHT, by Colin Hugh McIntosh. Published by McGraw-Hill Book Company in 1944. 177 pp. plus enclosures. Price $2.50.

A book by the chief navigator of American Airlines written as a text for training pilots and navigators in the essential techniques of long-range flight.

BASIC AIR NAVIGATION, by Elbert F. Blackburn; published by McGraw-Hill-Whittlesey in 1944. 300 pp. Price $4.

A comprehensive analysis of the air navigator's problems from the time the first flight is planned until the destination is reached. Chapter on instruments especially informative.

NAVY IN THE SKY, by Lieut. Wallace W. Elton, USNR. Published by McGraw-Hill Book Co., in 1944. 104 pp. Price $2.

Pictorial book largely designed for indoctrinating new Naval aviation personnel. Gives overall picture of Naval aviation with superb photographs taken by Navy photographers.

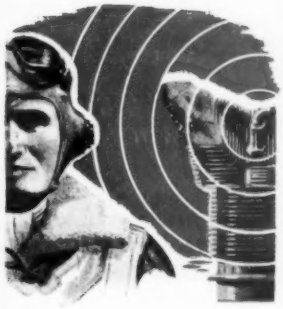
CLEARING all Wires!

Breeze Flexible Conduit Shields and Protects Communications and Wiring Systems

Any current-carrying wire in an aircraft electrical system is a potential source of interference with radio communications unless properly shielded. Breeze Flexible Shielding Conduit, produced in a wide range of diameters, can be used in conjunction with Breeze Conduit Fittings and Multiple Electrical Connectors to meet practically any shielding requirement.

The custom design of complete radio ignition shielding harnesses is a Breeze specialty, based on years of pioneering experience in the field.

Breeze Flexible Shielding Conduit is in service today with fighting units of land, sea, and air, supplementing the many other well-known items of Breeze equipment that are helping the United Nations along the road to Victory.

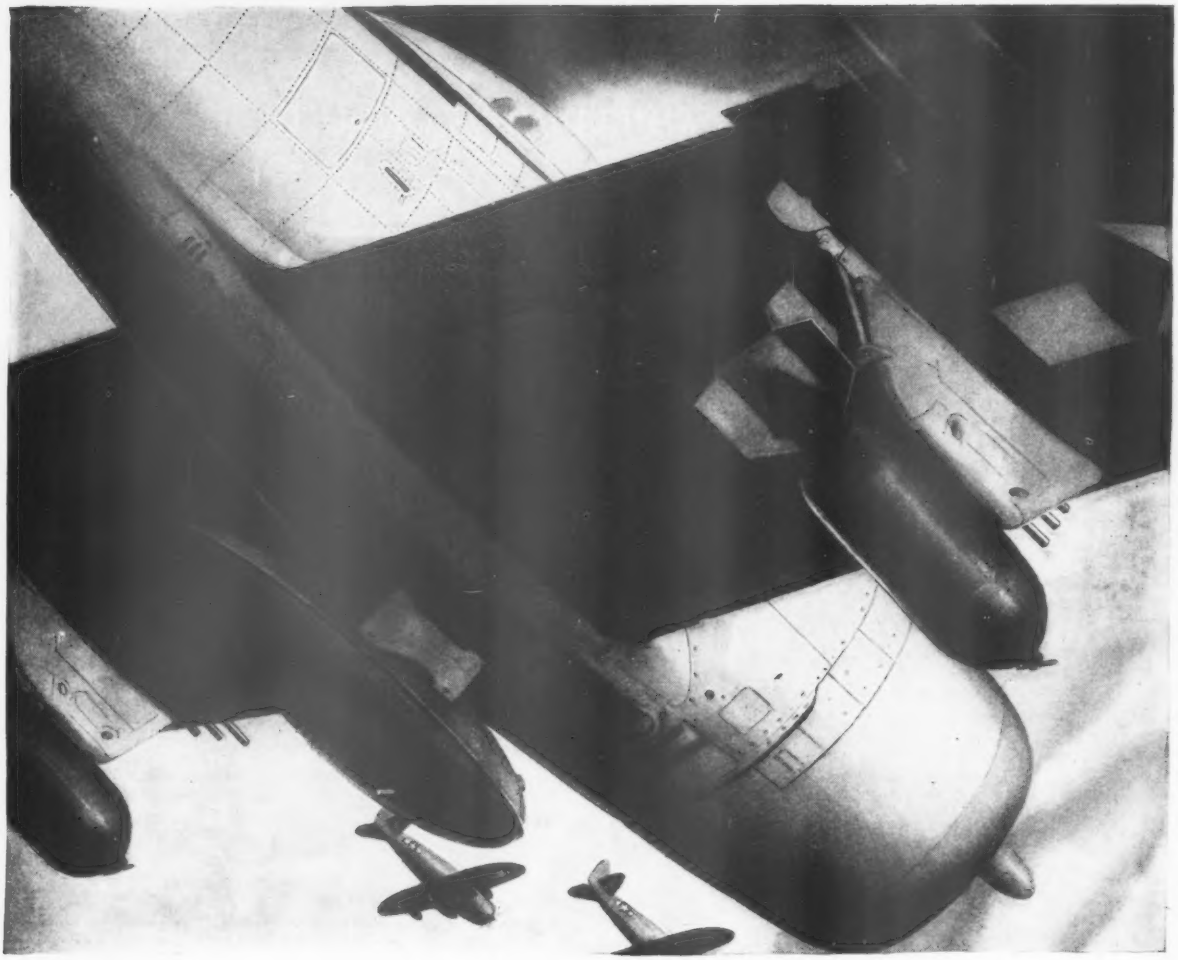


Breeze Shielding guards communications against high frequency interference from spark plugs and ignition system circuits.

Breeze BREEZE MARK

CORPORATIONS, INC. NEWARK, N. J.

PRODUCTION FOR VICTORY • PRODUCTS FOR PEACE



When a Thunderbolt strikes . . . anything can happen

A THUNDERBOLT roars over the Channel. Calais coming up! An ack-ack gun barks in German from a flak tower. But not for long. Eight 50-caliber machine guns ram hot steel down its throat.

Work to be done upstairs? A flight of Thunderbolts swoops down from high heaven to scatter a cloud of ME's harrying Fortresses on bombing runs over Berlin.

Work to be done on the "deck"? Two earth-quaking bombs slip from beneath a diving Thunderbolt's wings at tree-top level. A bridge blows up . . . and with it the last chance of Nazi reserves to reach the invasion front.

Flown by the finest pilots in the world, the Thunderbolt comes alive. When it strikes, high or low, anything can happen. Guided by skilled hands, it's a fighter that *does everything*. And when hundreds of them strike, everything *does* happen.

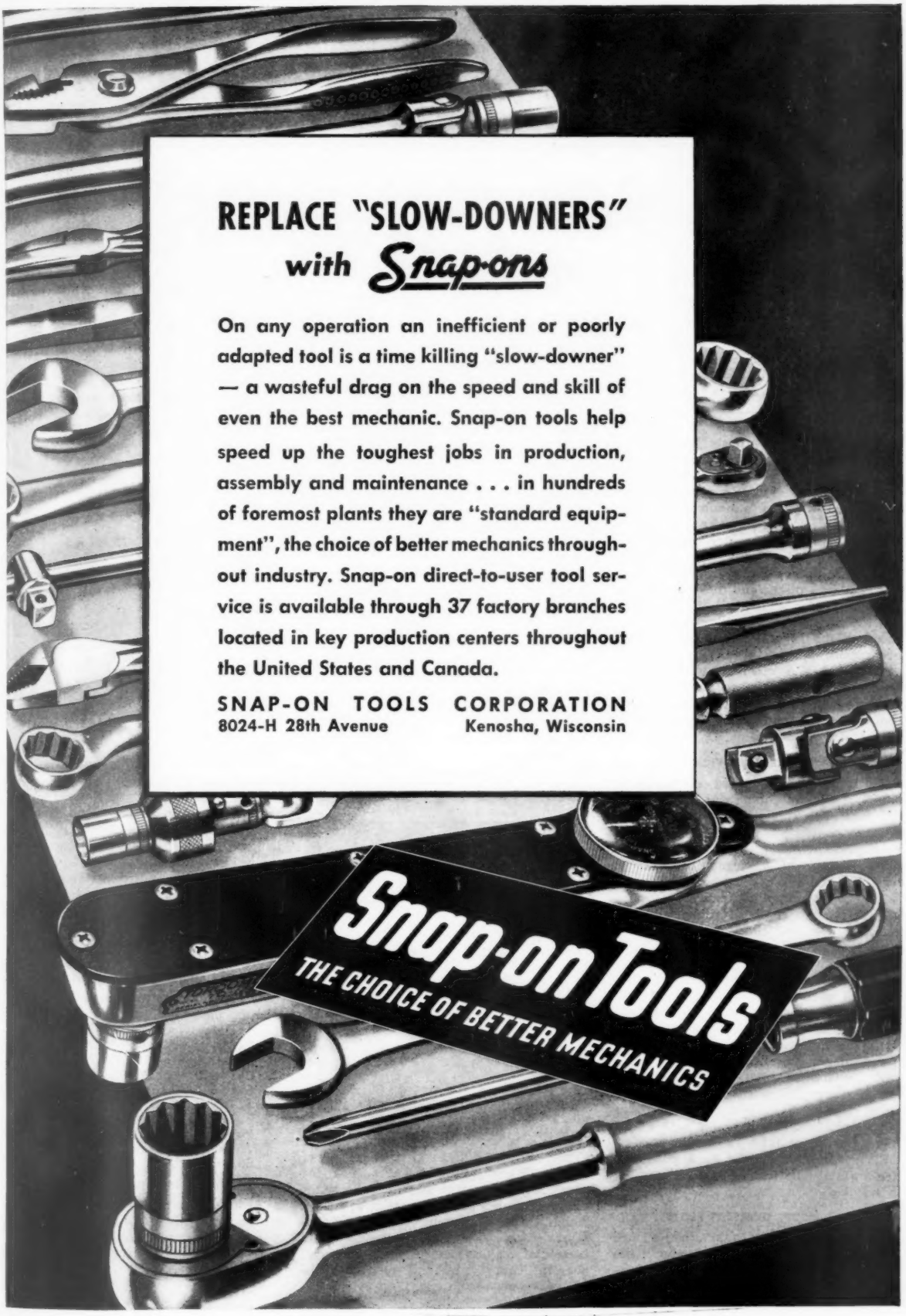
The newest Republic P-47 Thunderbolt, with bubble canopy, gives a pilot around-the-clock vision. With hundreds more "emergency" horsepower, he makes and breaks contact with the enemy at will. New propellers add 400 feet per minute to his climb. With a doubled radius of action, the protection of the Thunderbolt's devastating fire power permits heavy bombers a deeper penetration into enemy territory.

Stratosphere fighter, long distance escort, dive bomber, ground strafer—the Republic P-47 Thunderbolt is a busy plane these invasion days.

Republic Aviation Corporation, Farmingdale, Long Island, New York, and *Evansville, Indiana.*

Republic *firsts* in war point to *firsts* in peace

REPUBLIC AVIATION
CORPORATION
Specialists in High-speed, High-altitude Aircraft


REPLACE "SLOW-DOWNERS"
with Snap-ons
On any operation an inefficient or poorly adapted tool is a time killing "slow-downer" — a wasteful drag on the speed and skill of even the best mechanic. Snap-on tools help speed up the toughest jobs in production, assembly and maintenance . . . in hundreds of foremost plants they are "standard equipment", the choice of better mechanics throughout industry. Snap-on direct-to-user tool service is available through 37 factory branches located in key production centers throughout the United States and Canada.
SNAP-ON TOOLS CORPORATION
8024-H 28th Avenue Kenosha, Wisconsin
Snap-on Tools
THE CHOICE OF BETTER MECHANICS

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

The Aircraft Owners and Pilots Association (AOPA) with National Service Office located in the Carpenters Bldg., Washington, and Registrar's Office in the Michigan Square Bldg., Chicago, is a non-profit organization composed exclusively of pilots. It looks after the pilot's best interests in all phases of aviation and helps individual pilots with their individual problems. The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is edited by the Aircraft Owners and Pilots Association and opinions contained in it are not necessarily those of FLYING. A special Bulletin is sent each month to all registered AOPA pilots and also confidential memorandums from AOPA's Washington staff are sent members from time to time.

IN RESPONSE to requests from pilots, AOPA is wrestling with printing estimates in connection with a proposal to issue a directory of AOPA pilots. There are now so many names involved it would take a full-size book to make a complete directory. In view of paper shortages, it is now contemplated that the directory will list the names and registration numbers of AOPA pilots, and those in service will have an appropriate notation mark before their names. In like manner, deceased members will be given separate recognition.

So that AOPA officials may evaluate the need for this *AOPA Pilots' Directory*, an expression of opinion is being solicited from members and final decision will rest upon this policy.

MEMBERS IN SERVICE

AOPA now has record of approximately 1,350 pilot-members in service. This figure we know is much too low and indicates that we have merely scratched the surface in trying to catalogue AOPA pilots serving with the armed forces. We urge all readers of this column who know of AOPA members in service to report this fact to the AOPA National Service Office, Carpenters Bldg., Washington 1, D. C., so that these names may be placed on the Service Scroll.

Pictured herewith are three AOPA members serving with the Army Air Forces. Standing below the nose of their Fortress, the "Sad Sack," are **Lieuts. William A. Shackelford** (AOPA 6525) and **George R. Shullo** (AOPA 3979). Both are from Akron, O., and were active in the Akron Pilots Club in their Cub-flying days.

Also pictured in the pilot seat of an Army bomber is **John T. Hardin** (AOPA 10828). The AOPA *Pilot* this month carries an additional list of AOPA members in service.

AOPA PILOTS OVERSEAS PROTEST

Although many civil pilots in the U. S. have been very complacent about the sweeping epidemic of "aviation legislationitis," the foreign contingent of AOPA members in service write blistering denunciations and, we think, rightly so. They resent the passage of many state bills during their absence, many of which are the very ones they have succeeded in fighting off in previous years when they were at home. An AOPA member who carries AOPA Reg. No. 7311, and whom we shall identify only as a major serving at present with the Eighth Air Force, summarizes typical foreign AOPA membership feeling as follows:

"Many of us are overseas doing what we can to get this war over with so we can return to what we hope will be an America of reasonable personal freedom. To me, and to a great many others, the freedom to use a small plane under truly sensible conditions and without any bureaucratic holding of our hands is going to be more or less symbolic of whether this much talked of 'freedom' is genuine or merely a wartime slogan.

"I hope that those of you who are at home will do all you can to open your minds to ideas such as contained in this article ('Do Our Weather Minimums Make Sense,' AOPA *Pilot*, April, 1944) so that you may plan the kind of a system that will make us glad that we did this job while you did that one."

That's pretty strong language, but it relates to a very vital question which civilian pilots through the AOPA are facing realistically and for which we are demanding immediate and practical answers.

Lieuts. William A. Shackleford, AOPA 6525, and George R. Shullo, AOPA 3979.

MORE PLANES AVAILABLE

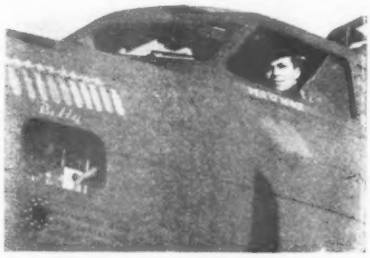
The Surplus War Property Division of the RFC has advised AOPA that the Army will turn over considerable numbers of training planes in the near future which are no longer needed in their programs. These planes, we are advised, will be sold at various concentration points all over the country, but mostly from abandoned primary training schools which are generally located south of the 36th meridian. Sales will be handled by RFC offices in those territories. Later the Army expects to activate some of their fields north of the present abandoned air fields and they will also be used as selling points.

To members only, AOPA can provide specific information regarding the names of persons to contact pertaining to the handling of these sales or specific information on aircraft when available at these points.

The Navy Department has reported to AOPA that a number of gliders of different types will also be available for sale. AOPA members desiring information regarding the purchase of surplus gliders should address their inquiries to the AOPA National Service Office.

INSPECT BEFORE YOU BUY

AOPA again cautions all pilots who buy used aircraft equipment, whether from the Defense Plant Corporation or other individuals, to inspect aircraft they propose to purchase. They should do this themselves or send someone. We are urging Government officials to publish along with other information at least general categories indicating the condition of the aircraft involved. A very bad and unnecessary situation exists wherein individuals are required to bid "blind" on aircraft, not knowing whether they are in good flyable condition, in bad need of repair, or a distorted heap of junk.



John T. Hardin, AOPA 10828.

We intend to dispatch a detailed report to members in the *Washington Newsletter* before the publication date of this column.

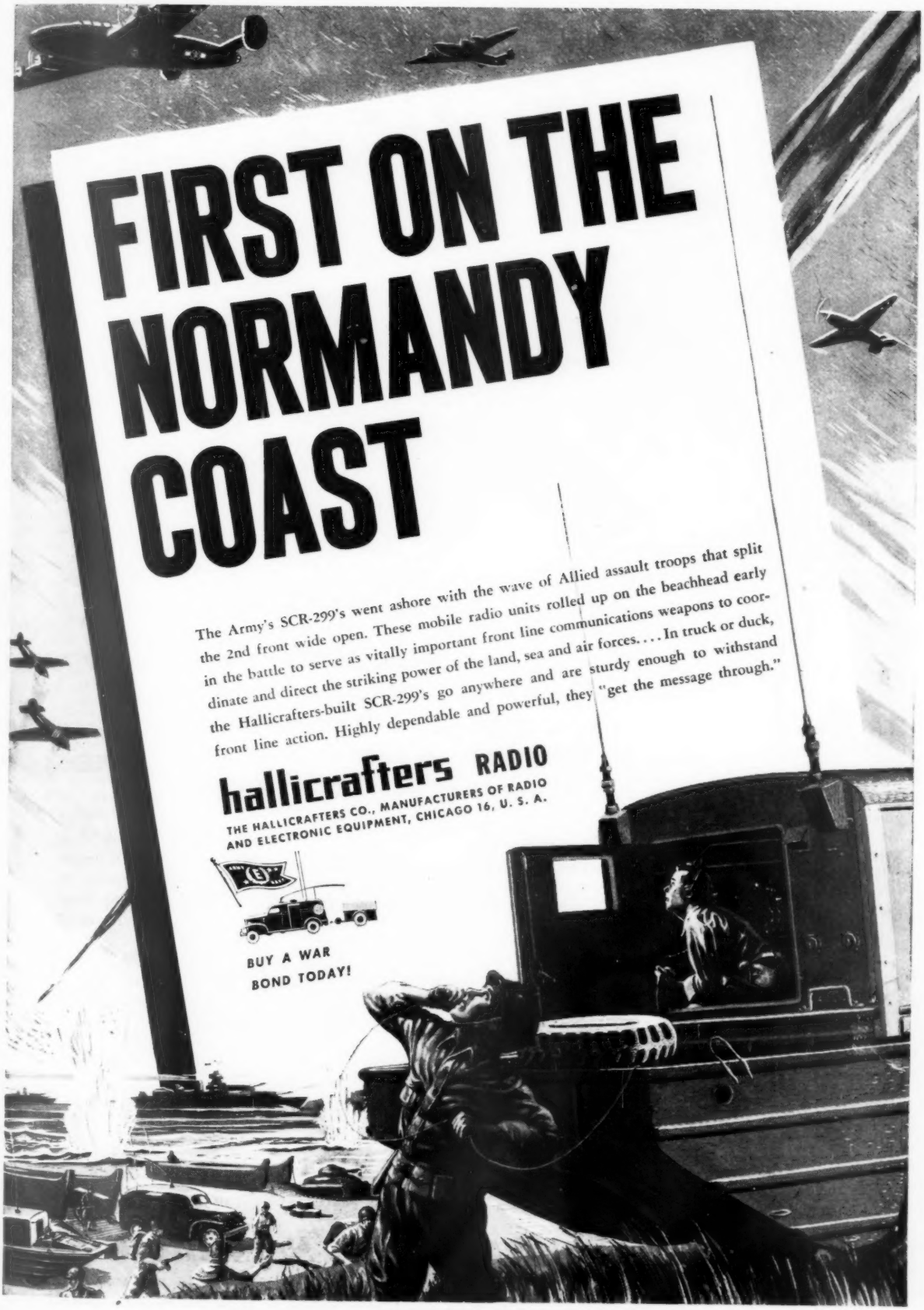
LOST MEMBERS

We have lost track of the following AOPA members and are holding mail for them. Anyone knowing their whereabouts, please contact the AOPA Registrar's Office.

Carl A. Farnsworth, AOPA 9048
Richard E. Flynn, AOPA 10957
Charles E. Hall, AOPA 2680
Charles F. Kimbley, AOPA 9924
C. DeBarnard Leigh, AOPA 5022
Earl William Newton, Jr., AOPA 9336
Ralph C. Padilla, AOPA 8075
William Yates Stafford, AOPA 4660
Edward A. Ulco, AOPA 9209

INSPECTION REPORT

Aero Insurance Underwriters have made available a daily inspection report form which is recommended to all AOPA aircraft owners. Write us for a supply of these forms. . . . END


FIRST ON THE NORMANDY COAST
The Army's SCR-299's went ashore with the wave of Allied assault troops that split the 2nd front wide open. These mobile radio units rolled up on the beachhead early in the battle to serve as vitally important front line communications weapons to coordinate and direct the striking power of the land, sea and air forces. . . . In truck or duck, the Hallicrafters-built SCR-299's go anywhere and are sturdy enough to withstand front line action. Highly dependable and powerful, they "get the message through."
hallicrafters RADIO
THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.
BUY A WAR BOND TODAY!

Notiz!
North American P-51 Mustang Fighter
Ein Tiefdeckerflügel Eindecker mit langer Nase, langem, schlankem Rumpf, großem bauchwärtigem Kühler, Einzelflosse und
Vierblatt-Propeller. In den Tragflächen montiert: Sechs 50-kalibrige Maschinengewehre
Gilt als das schnellste Flugzeug

ATTENTION LUFTWAFFE! Keep away from this plane. Expect to see it on the farthest trip American bombers make. Expect to see it up high—40,000 feet—but don't expect to see it for long, because the Mustang travels at over 425 m.p.h. And you can expect to see more and more Mustangs, too. The men and women at North American are stepping up production every month. So when you see this high fighting, far flying Mustang, look out, Luftwaffe. Get out of there quick!

North American P-51 Mustang Fighter

ATTENTION AMERICANS! BONDS bought these planes. WASTE FATS helped arm them. WASTE PAPER helped ship them. GASOLINE flies them. Will YOU help to deliver the next squadron?

FULL-VISION "TEARDROP" COCKPIT ENCLOSURE DROPABLE WING GAS TANKS, FOR INCREASED RANGE SIX .50 CALIBER MACHINE GUNS

North American Aviation *Sets the Pace*

WE MAKE PLANES THAT MAKE HEADLINES . . . *the B-25 Mitchell bomber, AT-6 Texan combat trainer, P-51 Mustang fighter (A-36 fighter-bomber), and the B-24 Liberator bomber. North American Aviation, Inc. Member, Aircraft War Production Council, Inc.*

"The Lucky Stiff"

You see him . . . but you don't understand him . . . He's wings, bars, uniform, youth, high adventure, glamour to the girls, comic strip hero to the kids. His mother's friends say it's *so nice* that he got a commission! . . . At home on leave he gags about his job, just good clean fun. His family finds him a little aloof, less talkative . . . Sometimes he shows up a year later with a ridiculous rank for his age, a double row of ribbons, tired eyes, marked reticence . . . And some people say enviously, "The lucky stiff" . . . Listen—

LEARNING TO FLY the Army way isn't lollipops . . . Each day he dies a little until he learns to put down his natural fear, forces instinct, intellect, nerves to take on hard new habits . . . anticipates every possible accident, conditions himself to danger . . . He grows in grace, confidence, and judgment of distance from the ground. "Precision" begins to be more than a word . . . He breakfasts with a bunkmate who is on his way home by night —in a casket . . . A few short months and some mighty long moments make him a pilot, more afraid of failure than death . . . Put this down in your book: Wings never come cheap!

In the cockpit, he meets Responsibility . . . charged with a quarter-million dollar plane, nine lives besides his own, kid gunners who expect him to be God at times, a hundred items to check before a take-off; maps, air photographs, flight plans, instructions to get right, and remember . . .

EVENTUALLY he finds himself garbed and goggled and masked like some monster, slow oozing oxygen . . . unnaturally alert, always apprehensive, incredibly lonely . . . up in an eerie world where unearthly light tries his eyes, thin air threatens blue death in minutes, ravenous cold gnaws at his gloved fingers, fantasy tricks his senses . . . Evil black blossoms of flak buffet the sky. Fighters close in out of nowhere streaming destruction. A bomber ahead vanishes suddenly in a golden burst. Another sidles down in a smoke trail, spawning specks of parachutes . . . The target far below is vague and gauzy, hard to certify. The twenty second bombing run seems a lifetime . . .

Sometimes the return trip is just a long toboggan ride; sometimes a long nightmare nagged by fighters, an anxious inching back with the shot-up ship hard to handle, some dead props and dying men, a landing that leaves him limp. Missions end with missing ships, missing men, sleep that comes harder . . . yet he carries on with the cruelest, lousiest job on earth.

FOR WHAT? Flying pay, rank and ribbons don't mean much if you're dead tomorrow. But these men know they have found a job bigger than they are . . . the extermination of maniacs who menace the whole hope and future of all mankind . . . the stoppage of war at its source to save lives, dirty work, matériel and time for the ground forces, speed the finish fight . . . Do you begrudge a bomber crew anything that will make their job easier, more effective?

Be a patriot—buy another War Bond! Sounds pretty shoddy, doesn't it? . . . For how much of anybody's money will you match *your* life? Can any amount of Bond sales square one day's losses of bomber crews? Lending money may hurt—but can't kill! Your pledge of a billion would still be small change stacked up with these boys who sign on the dotted line with Death every mission! . . . Any way you figure it, those of us who stay at home, know where we'll be tomorrow—and not the boys in the bombers —are the only "lucky stiffs" in this war. And let's not hold our luck cheap!

This advertisement for the Fifth War Loan is sponsored by Jacobs Aircraft Engine Co., Pottstown, Pa. . . . largest manufacturer of aircraft engines in the medium power class.

A Four-Point Program for Aviation

(*Continued from page 47*)

on Naval Affairs (the Hon. Carl Vinson), the chairman of the House Committee on Interstate and Foreign Commerce, a judge of the Circuit Court of Appeals, and a lawyer and banker, Dwight Morrow.

The board was non-partisan and non-political, and no member was directly interested in commercial or military aviation. The character and integrity of its members was such as to assure public confidence in their findings.

It heard nearly 100 witnesses and many conflicting opinions. At that time, the condition of the aeronautical art was such that little could be drawn from experience, yet the public had strong confidence in the future of aviation. After a short but active inquiry, the board submitted a unanimous report.

Against the background of charge and countercharge incident to the Mitchell controversy, the board's findings were unexciting. Yet they were so sound in principle that the report (now out of print), deserves reading and re-reading today even by those familiar with it. Congress accepted its recommendations and embodied them in the Air Corps Act of 1926. It created the office of assistant secretary for air in the departments of War, Navy and Commerce.

The board held, in effect, that a strong air force is vital to national security, that the backbone of this air force must be a strong, private industry, and that a long term, continuing program of procurement is essential to the creation of adequate engineering staffs and the acceleration of the new technology. Thus, the board fixed responsibility for American air power jointly upon Government and private industry.

We take pride in the fact that the aircraft industry has fully discharged its responsibilities, even though at times the people's desire for peace caused them to falter in support of the Morrow Board's policy. Whereas, in World War I, we borrowed aircraft from our Allies, in World War II, we supplied them thousands of fighting planes.

The board realized the vital strategic importance of advanced engineering. It recognized the handicaps inherent in Government design and appreciated the need of private competition for the development of creative design staffs. It also stressed the impracticability of maintaining a peacetime industry adequate to the requirements of war. It emphasized the need for rapid expansion in emergency and visualized it taking place around a small but potent aircraft industry. This forced aircraft designers to conceive an entirely new theory of quantity production, one that relieved industry of the need for freezing designs, and permitted it to expand phenomenally while introducing new and better models.

As contemplated by the Morrow Board, the Post Office initiated the development of air transport through contract air mail under private operation. Regulation and airways development were centered in the Department of Commerce. Technical improvements were encouraged by keen, constructive performance competition. Destructive rate competition was avoided.

Simultaneously, technological development was encouraged through healthy rivalry between the armed services. Intercompany competition has continued in war, though aircraft manufacturers have shared their experience freely through their War Production Councils. They have co-operated in this crisis as effectively as they once competed in normal times.

The benefits of competition were also shared between the armed services and the air transport operators to the advancement of both. Aircraft was able to achieve its present dominance because, in the years before the war, this development was permitted by the long range program evolved by the Morrow Board in 1925.

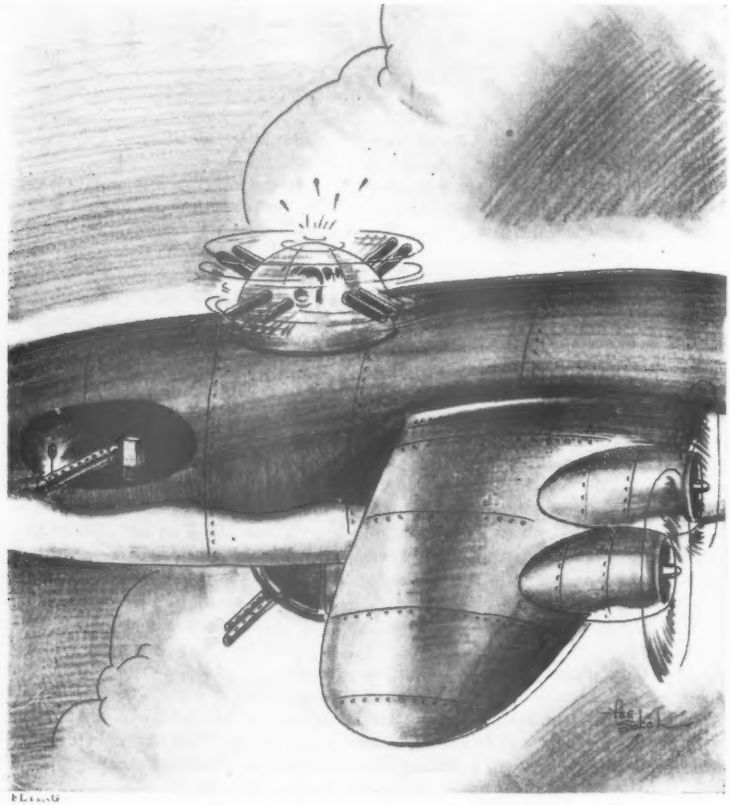
Men have long realized the vital importance to peace and prosperity of free communication by land, but it was not until 1889 that the decisive character of overwater communications became apparent. Then, Capt. A. T. Mahan, in his classic treatise, "The Influence of Sea Power Upon History," concluded that since the dawn of marine transport, victory in war and prosperity in peace have rested with the nation which exercised control of sea communications.

During the 19th century, the world enjoyed unexampled prosperity coupled with spiritual and material progress. The combined British and American Sea Power swept piracy from the high seas and guaranteed the right of innocent passage to all who proceeded on their lawful business.

In the 20th century, this freedom of the seas has been challenged twice. In World War I, the Germans challenged with the submarine. The Japanese at first found it expedient to ally themselves with us to obtain German and other Pacific bases. Then, when the Germans tried again with the submarine (their air force being military), the Japanese challenged with naval air power.

We have met this latest challenge by a rapid expansion of land, sea, and air power. Today, our air power is supreme: The combined military and naval air forces of the United States now constitute the world's largest air force. Our aircraft manufacturing establishment is recognized as the world's No. 1 industrial giant. Our private domestic and international systems of air transport, already the world's largest and best before the war, have expanded by leaps and bounds.

At strategic points along the airlanes of the world we have built a powerful net-



"How do you shut this damn thing off?"

Rough sliding means trouble!

Exclusive Crown Zipper tooth construction assures quick, smooth, effortless sliding, even around sharp curves!

Look at a Crown Zipper closely, and what do you see? Each individual tooth is identical on both sides!

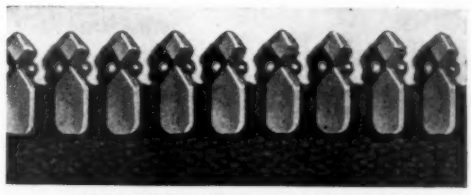
This exclusive Crown design permits the sliders on Crown Zippers to move with perfect freedom in both directions along the zipper track.

Even on heavy aircraft and truck-tractor covers, Crown Zippers operate quickly, smoothly, almost effortlessly—take sharpest curves without sticking or bunching the fabric.

This big, basic Crown Zipper advantage is but one of *many* Crown superiorities that will make for better service in postwar aircraft equipment applications.

Actually, Crown engineers, working in the field with our armed forces, have developed *five* advancements over old-style, conventional zippers. (See complete list of Crown Zipper superiorities below.)

When *you* turn to postwar, Crown's great backlog of experience in improving zipper design and in adapting zippers to meet special jobs will be invaluable. For our designers will sit down with your own designers to adapt — or, if necessary, *create* — special zipper applications to meet your individual manufacturing needs.



ONLY CROWN ZIPPER TEETH ARE IDENTICAL ON BOTH SIDES, TO INSURE SMOOTH SLIDING!

CROWN ZIPPERS are 5 ways better

1. Takes sharp curves

2. Die-cast for smoother action—extra strength

3. Provides opening wherever you want it

4. Won't lock open

5. Resists corrosion

Member of the J. & P. Coats • Clark's O N T *Family*

THE SPOOL COTTON COMPANY • *745 Fifth Avenue, New York, N. Y.* (*Crown Fastener Division*)

Getting 'Em Back, INTO THE BLUE!

A FIGHTING plane or bomber *in the air* is one of our most potent weapons; *on the ground,* as a weapon of attack or defense, it is worthless. The air corps begrudges every minute that a plane is tied up for reconditioning or repairs.

That is why a quick-disconnect coupling, developed by Thompson and now being made in great quantities for aircraft engine builders, is such an important contribution. With this new coupling, no time is wasted in bleeding the many fluid lines when making repairs. Oil, gasoline and anti-freeze lines disconnect with a quick turn and seal automatically as they uncouple. Power units can be lifted out, repaired or replaced—and precious time saved in keeping planes fit to fight.

The Thompson quick-disconnect coupling is only one item among hundreds of different precision parts and accessories made by Thompson workers. In this—a mechanized war—these parts are needed for every type of military equipment that uses internal combustion power. Thompson workers have the satisfaction of knowing that they have a part—a vital part—in every battle, on land, sea, or in the air.

The Thompson quick-disconnect coupling, originally designed for aircraft, is being adapted to other military mechanisms that use internal combustion power. When peace comes its use will be broadened far beyond its present military applications.

Thompson Products, Inc.

THOMPSON AIRCRAFT PRODUCTS CO.

MANUFACTURERS OF AUTOMOTIVE AND AIRCRAFT PARTS
GENERAL OFFICES: CLEVELAND. PLANTS IN OHIO, MICHIGAN, CALIFORNIA, AND ONTARIO CANADA

BEATING PRODUCTION SCHEDULES ON VITAL PARTS FOR PLANES, TANKS, SUBMARINES, PT BOATS, TORPEDOES, JEEPS, HALF-TRACKS, TRACTORS, AND TRUCKS

work of air bases. They are as vital to air power as are naval bases to sea power. With these stepping stones, the Army and Navy air transport organizations have rushed men and materials to distant points. The delivery of critical materials at the right time produced decisive results.

We have extended air lanes in all directions. Though we look at these now as outward flowing streams, we must not forget that they are channels leading to the very heart of the country. Mahan, discussing the decisive influence of sea power upon our Civil War, and referring to the tightening of the Northern blockade, said, "The stream that carried the wealth and supported the trade of the Southern states turned against them and admitted their enemies to their hearts."

This sea power comprised five basic elements: the merchant marine; strategic bases; the Navy; the shipbuilding industry; and a seafaring tradition. The cost of the Navy was accepted as a proper charge against the cost of water transport—yes, even as an investment in world prosperity.

Similarly, we see air power comprising the same elements: an expanding commercial air transport; strategic air bases; military and naval air forces; a sound aircraft manufacturing industry; and an air-minded public.

The precise influence upon history of air power is now in the process of determination, but air power's influence upon land and sea communications has been made abundantly clear. Fundamentally, the isolation once enjoyed behind land or sea frontiers is forever gone.

Today, the aircraft manufacturing industry operates on a high plateau, having passed successively through three crises. The first crisis involved a shortage of machine tools, the second, a shortage of materials, and the third, a shortage of manpower. Within the latter there is an element of grave danger. Competent management and competent engineering are items whose importance cannot be overstressed.

But the ability, even the willingness to take responsibility for management is a rare and precious quality. In a highly specialized engineering art like aviation, even men of real aptitude or competence must acquire experience before they are useful. Even then a special quality is necessary for men who must conceive and create new art.

Ours is the responsibility to provide combat crews with aircraft of advanced design. We must take care that no adversary surprises us with some secret weapon. A technological advantage once lost is not likely to be recovered.

Aviation is a young industry. Most of its personnel is young. Thus, we are certain that the public interest requires the maintenance of the integrity of management and engineering in the aircraft industry. Removal of young engineers from private industry or interruption of a steady flow of them into it is fraught with grave dangers. A design staff once lost is not likely to be restored.

Turning now to production schedules, it is apparent that the very magnitude of the expansion of the aircraft industry makes it especially vulnerable to changes and cutbacks. Since renegotiation of contracts precludes the accumulation of reserves adequate to any contract termination that is not orderly and swift, the Government must accept its responsibilities in termination for all costs, including separation wages, lest important elements of the industry fail to survive. Until the completion of the cycle, "war profits" are wholly illusory.

Our situation differs markedly from that of the automobile industry. Every day that passes, more automobiles wear out and the demand for new cars increases. Similarly, every day that passes, automobile companies contribute to the surplus of aircraft and aircraft parts. At termination, automotive companies can reconvert, while aircraft companies must cut back to whatever remains.

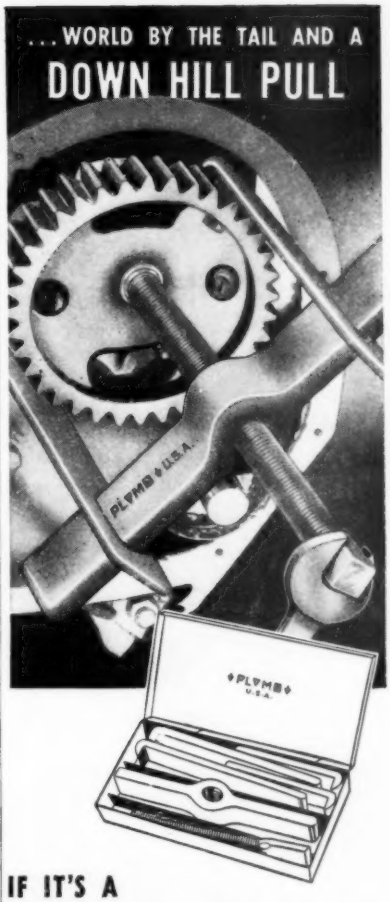
While the airplane and automobile both date from the beginning of this century, and while 40-odd years later the automotive and aircraft industries are collaborating in the production of aircraft industry designs for the war effort, the two industries are fundamentally different. The automobile has had wide private use. The airplane, on the other hand, has been used principally in public service. The industry is almost wholly dependent upon Government policy.

The problem of surplus war products is thus of peculiar concern to aircraft manufacturers. We note with satisfaction the steps being taken to provide necessary legislation to permit terminating contracts speedily and disposing of war surpluses in an orderly manner. We are impressed with the magnitude of this task and the need for courageous administration and control.

The factor of obsolescence is vitally important in aviation. Equipment is frequently made obsolete by technical improvement long before it has worn out in use. This factor should be given full consideration in controlling production. The flow of material must not run too far ahead of requirements, lest the latest service changes and improvements be not incorporated in combat aircraft.

Thus, the conduct of the war and plans for the future combine to dictate the first steps in surplus control. To the fullest extent consistent with meeting every need of the armed services, the tightest rein should be held on current production to avoid unnecessary accumulation of inventories in the hands of suppliers and of finished products and spares in reserve.

Surplus aircraft materials should not be viewed as excess inventory to be liquidated like commercial products, but rather in the nature of a reserve. It is public property. It should be administered with broad regard for the public interest. The public interest demands the maintenance of a reasonable level of employment. Dumping surpluses could so unbalance the aircraft industry and the whole national economy that the cost of unemployment compensation, or relief, could quickly exceed any recovery through sale of surplus. War surplus



IF IT'S A
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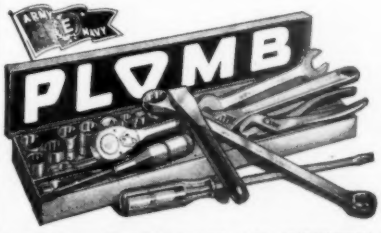
They choose the other service tools in the complete Plomb Line, too—for the same reasons. From tiny screw drivers to mammoth industrial wrenches, all are built to highest quality standards. Select the ones you need for your war job from the Plomb dealer in your neighborhood. — *Plomb Tool Co., Los Angeles 54, Calif.*



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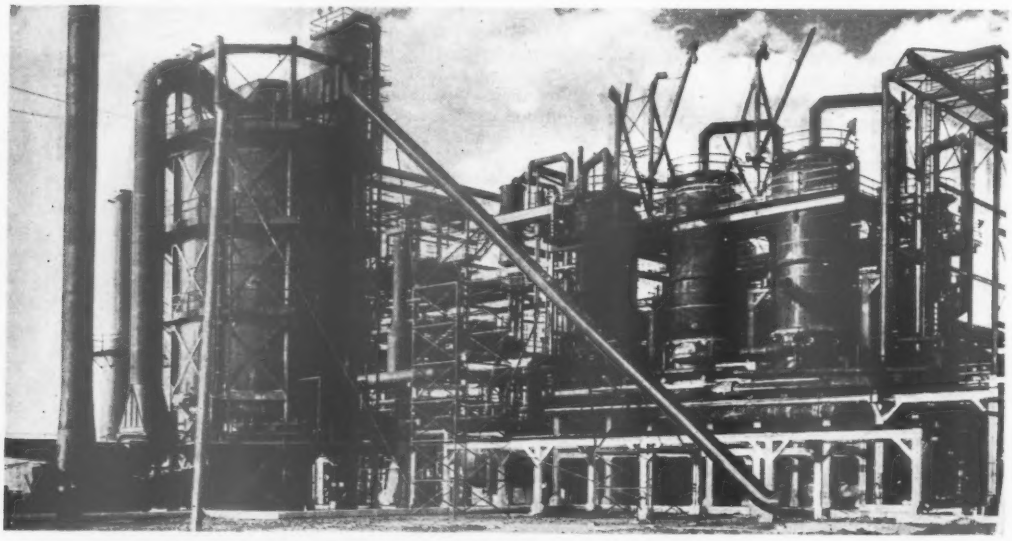
OUR BOYS can fly these four-engined bombers faster, higher and carry more bombs because they use 100-Octane Aviation Gasoline, the most powerful gasoline in the world.



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Second. Parts and service must always be available. Here Kinners are outstanding. For no Kinner engine has ever been orphaned, nor will a Kinner ever be permitted to become an orphan. Genuine Kinner parts are always available, Kinner service is always ready to help keep engines operating economically, keep planes in the air.

For the past 25 years, Kinner has built dependable, economical aircraft engines. And Kinner has protected owners and operators with a broad service and repair policy. In the days ahead, enjoy Kinner dependability in flight, capitalize on Kinner's assurance of a constant supply of parts and service.

KINNER MOTORS, INC.
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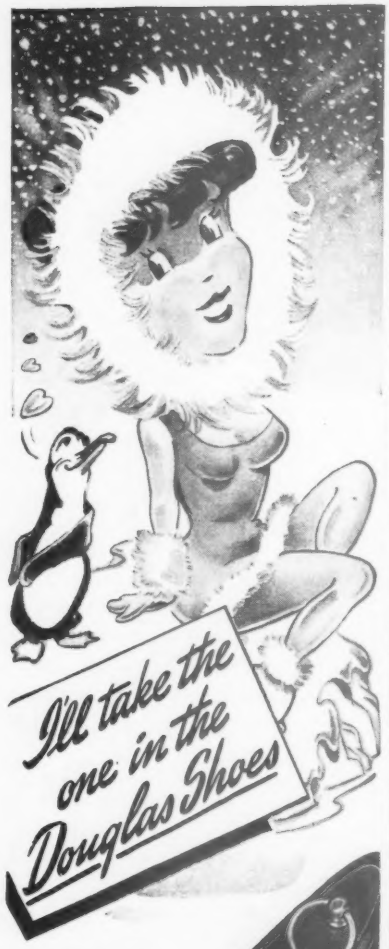
Kinner

1919 — BUILDERS OF DEPENDABLE AIRCRAFT ENGINES FOR A QUARTER CENTURY — 1944



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must be considered in the light of other goods expended in the war effort. Good business judgment demands "no dumping."

Surplus aircraft will fall into two categories, those restricted to war purposes and those capable of conversion to commercial uses. The most modern surplus military aircraft should be stored in reserve. This will help employ available excess facilities. Convertible types should be used to promote air transport and private flying.

The rapid rate of obsolescence of aircraft makes timing the key to a sound disposal policy. The sooner surplus planes are made available for commercial purposes the more completely will desirable objectives be achieved. The immediate commercial use of surplus equipment before new improved models are generally available will aid in creating demand for improved equipment.

The vital principle here is that surplus aircraft must not be permitted to destroy the aircraft manufacturing industry. On the contrary, they must be so utilized as to nourish it. The public interest requires that the aircraft manufacturing industry operate at the rate necessary to promote the creation of new designs and to facilitate rapid expansion in emergency. This must be accomplished through a continuing, orderly program of competitive procurement for the Army and Navy air forces as well as expanding private purchases for domestic and foreign transport. The whole should be supported by direct expenditures with the industry for research and experimental development.

In the matter of Government-owned facilities, we are gratified by the steps being taken. Here, too, the controlling principle is the public interest. It must always be kept in mind that until the industry can develop a private market, the Government is directly or indirectly its chief customer. It is axiomatic that no seller can compete successfully with his customer and that the private aircraft industry could not survive Government competition.

The production record to date clearly shows the wisdom of having depended entirely upon private industry for aircraft. Industry has met every requirement as to quantity and quality. The stimulus of private competition has produced great benefits. Technology has advanced. Costs have been dramatically reduced. The whole management of aircraft production in this war under the principles enunciated in the Morrow Report has been so successful as to indicate clearly the wisdom of continuing these policies. In fact, the whole relationship of Government and industry in the aircraft program sets a sound pattern for other lines for the future.

When the time comes for major cutbacks, the aircraft industry will face problems at least as difficult, if not more difficult, than those incident to expansion. There has been no opportunity to develop other new products. Today, aircraft production represents a substantial proportion of the national economy, and every opportunity should be afforded the industry to maintain itself at a reasonable level.

Continued manufacture of unneeded war goods would serve no useful purpose. We would simply be borrowing from future demand. This emphasizes the point made in the reports of the Vinson and Truman committees, that Government departments should begin planning now for long-term needs. Military and naval plans could approximate future requirements for several reasonable assumptions, and knowledge of these would assist private companies in their planning.

We also believe that the key lies in the field of air transport. Our domestic airlines are carrying a heavy war load with greatly reduced equipment. It seems unrealistic that at a time when other war activities have greatly expanded their plants, the airlines have been contracted. It would seem in the public interest to step up their operations to a maximum, thus relieving the over-burdened surface transport and speeding the conduct of war business.

The vital importance of international commercial air transport emphasizes the need for its expansion. This should be taken in hand now as an immediate contribution to the war effort and a wise provision for future needs. Expansion of air mail offers one profitable method.

The successful creation of the air forces under the War and Navy departments suggests the need for lodging responsibility for commercial air transport in an executive department. This department, in collaboration with the State, War and Navy departments, should operate under the American air power policy and in support of it. The office of assistant secretary for air in the Department of Commerce should be reestablished.

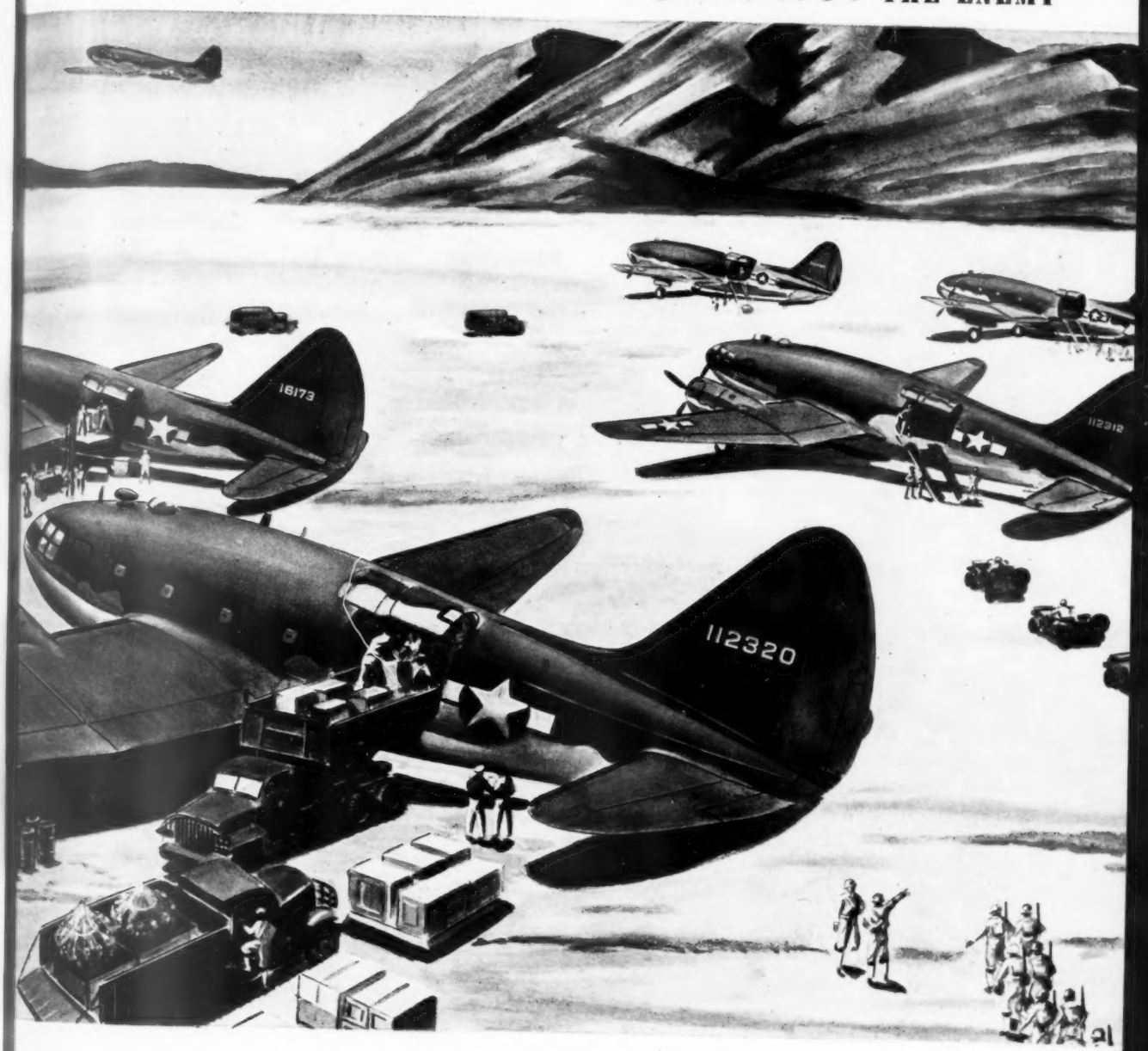
As in the case of the air forces, the key to progress in commercial air transport is technological development. Competition is essential in order that economic factors may direct technical progress along sound lines. A prerequisite to the progress of the war effort and to the future of American Air Transport is the continued development of transport aircraft.

Today, American transport planes embody technical developments which grew out of airline competition and competitive purchases by the Army and Navy from private manufacturers. These manufacturers reinvested their earnings in improved technology and low cost manufacturing so that, prior to the war, both American commercial and military aircraft dominated foreign markets because of low cost and superior performances.

It is a noteworthy fact that at a time when certain established American industries needed a protective tariff, the self-reliant young American aircraft industry, maintaining a high level of wages and salaries, was able to undersell all foreign competition even though some of this was subsidized.

Our experience leads us to certain conclusions as to the elementary economics of air power. Our people have long been persuaded that expenditures in preparation for war are an out-of-pocket expense and a burden tending to depress the standards of living. A free people seldom understands that an investment in protection against war may prove far more eco-

THAT OUR COUNTRY MIGHT *Out-Maneuver* THE ENEMY



Curtiss C-46 Commando Transport!

With the war in high gear, speed is the essence of victory! No nation can hope to wage global warfare and win without a means of moving vast numbers of men and a tremendous tonnage of supplies, long distances at high speed.

The Curtiss C-46 Commando Troop and Cargo Carrier has admirably met this demand for unprecedented mobility.

Today the Commando is a part of the greatest military transport program ever inaugurated. Tomorrow it will fly supplies for the rehabilitation of the world. Hard on the heels of victory, too, will come the Commando's conversion to both a luxury liner and a commercial cargo carrier for civilian service. LOOK TO THE SKY, AMERICA!

Another Contribution of

Curtiss-Wright
Corporation
AIRPLANE DIVISION

Toward Winning This War

BUFFALO · COLUMBUS · ST. LOUIS · LOUISVILLE

Member, Aircraft War Production Council, East Coast, Inc.

From our bomber plant in Georgia are coming B-29 Super-fortresses.

First American jet propelled plane, designed and built by Bell Aircraft.

The Bell Airacobra helped turn the tide at Stalingrad and on other fronts.

On many planes and ships are the Bell designed flexible gun mounts.

Preview of the new Bell fighter—as it will be seen in action by the Axis.

The Bell Helicopter—adaptable for many missions of war and peace.

Bell Aircraft at War

. . . A PROGRESS REPORT

A good fighter plane—basic in modern military operations—must pack plenty of wallop. That's why Bell Aircraft developed its hard-hitting Airacobra around a 37-millimeter cannon firing right through the nose of the plane.

This "cannon on wings"—first American single-engine fighter to carry a cannon in the skies—has turned in a performance which caused the Russians to tell WPB Chairman Donald M. Nelson the Airacobra was one of the American products they liked best. And today the Airacobra is being joined by a new Bell fighter, capable of high-speed, high-altitude performance.

Building such fighter planes is only one part which Bell Aircraft is playing in the war. On another front, the Bell Bomber plant in Georgia is producing the Boeing designed Super-fortresses (B-29's), largest long range bombers ever seen. And from our Ordnance Division in Burlington, Vt., come Bell designed gun mounts, including the new hydraulic power mount, that give the machine guns of many allied planes and surface ships their firing accuracy.

Meanwhile work is continuing on two other war projects, America's first jet propelled plane, and the new Bell Helicopter.

Post-war activities are being locked in our minds until the day of Victory. Then our organization, staffed with production men of skill and imagination, will turn their thoughts to pioneering in an aviation world at peace.

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MEMBER AIRCRAFT WAR PRODUCTION COUNCIL—EAST COAST, INC.

BELL *Aircraft*

PACEMAKER OF AVIATION PROGRESS

Niagara Frontier Division, Buffalo and Niagara Falls, N. Y.—Ordnance Division, Burlington, Vt.—Georgia Division, Marietta, Ga.

BUY WAR BONDS AND SPEED VICTORY

nomical in the long run. Beyond this, money intelligently invested in an air power adequate to keep the land, air and sea lanes open to commerce, will pay dividends through increased trade and the creation of new wealth. This is the history of each new form of transport.

Our own domestic air transport has been able to establish itself in direct competition with highly developed forms of surface transport by selling faster travel at competitive rates. It has furnished fast mail at premium rates high enough to return to the Post Office Department substantially more than the amounts paid it for transporting the mail. Thus, the Post Office has fostered a valuable public service with a profit to itself.

From the economic point of view, we could credit the air mail profit back against the cost of military and naval aircraft. We might also credit income from export sales. But a strict accounting isn't necessary to prove that providing for the common security is not necessarily a burden upon the people. Done through private industry, it can be an investment. The benefits of judicious purchases to further new technology are obvious. They create new opportunities for private investment, new enterprises and new employment. Expanded air transport offers jobs for trained aviation technicians discharged from the air forces.

The public character of aviation imposes upon it a dual role. Commercial companies, to advance their private interests and stimulate technical progress, must compete in the realm of operations. At the same time, they must collaborate in the realm of policy to promote the public interest. If any law or interpretation precludes such collaboration, it should be revoked. END

Nylon Life Savers

(*Continued from page 57*)

It is desirous that a certain amount of air be permitted to escape through the pores of the material. Because nylon is man-made, it is possible to regulate this factor by governing the porosity of the cloth—an advantage not necessarily true in silk where the whims of a silkworm might lead to varied thicknesses in a six-inch length of thread.

When carried into the sea a silk parachute must be washed in fresh water immediately or deterioration will set in, but nylon is not affected by salt water. Like silk it is as strong wet as dry but, unlike silk, nylon will not mildew. Nor do moths view nylon as food. Nylon will melt when in direct contact with flame but it will not burst into flame itself. Although it deteriorates about as rapidly as silk exposed to sunlight it shows no appreciable deterioration in the dark where much of the life of a parachute is spent.

The three types of rayon fall below the standard of nylon or silk. Rayon burns readily. It is subject to greater deterioration on exposure to sunlight. Its moisture absorption at any given relative humidity is above that of nylon and about the same as or less than that of silk. Its strength is less than either nylon or silk.

While man-made nylon and rayons can be made to equal the strength of silk, nylon can be turned out about 25 per cent stronger than the best rayon.

Strength tests are conducted on pressure machines that look much like a combination of a drug store scale and the carnival gadgets that strong men hammer to win cigars. If a piece of material pulls apart below a designated pressure, it is rejected. If a thread breaks at less than specified strength, it is thrown out. The tests are uncompromising. Lives swing in the balance.

The strength of a parachute is governed largely by its size which in turn is determined by the weight and nature of the object to be dropped.

The standard escape chute is 24 feet in diameter and will allow an airman to fall at a rate of 16 to 24 feet per second, depending upon his weight. A paratrooper who may carry up to 100 pounds of equipment will use a 28-foot parachute.

Sizes for emergency aerial delivery work vary from eight to 24 feet in diameter and while 14-inch pilot chutes are the smallest, 48-foot cargo-carrying parachutes with a load capacity of 3,000 pounds frequently are used. Chutes up to 150 feet are utilized for special purposes. In many cases, one, two or three parachutes are used in clusters for heavy loads.

The rate of descent and the ground impact are factors not overlooked. A crate of eggs must drop a lot slower than a piece of angle iron. Aerial delivery or cargo loads may be said to vary from five pounds to 10,000 pounds.

For this delivery work, chutes of red, deep blue and green are employed—vivid colors selected to be easily distinguishable against the sky. Chutes of other colors are used when the situation demands. A canopy of blue-green, for instance, might be dropped by the Navy in over-water work.

White continues to be the favored color for life-saving parachutes except for flyers working over ice and snow-covered Eskimo land. Here the chute canopies are a brilliant red or have red and white alternating panels. These fire-truck colors can easily be seen from rescue planes.

The camouflaged parachute, however, is designed to all but hide a haystack from the proverbial needle. The pattern itself appears to be a jumble of tan, green and olive drab. On closer inspection, however, it becomes apparent that each block of color resembles a leaf and that this leaf pattern is the same as that carried on camouflaged clothing.

Camouflage color and thus the pattern is stamped on the material by regular cloth-printing machines. The color will "run" to a small degree, but because parachutes generally see only limited use the printing method—ideal from a production standpoint—is not objectionable. Other chutes use dyed fabrics.

Until recently, parachute manufactur-

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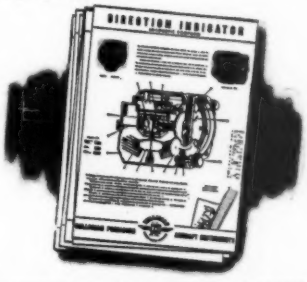
INSTRUCTIONAL INSTRUMENT PANEL

A full size instructional panel for pilots, clubs or flight schools. Has all the basic flight, navigational and engine instruments equipped with movable pointers so that sample flight problems can be set up and the action of the instruments explained. Panels of rigid cardboard with double easels. Price, including shipping, $1.00 each.

THE POPULAR KOLLSMAN INSTRUMENT HANDBOOK

Now Widely Used By Maintenance Men and In Classrooms of Aviation Courses Everywhere

150-page leather-covered looseleaf book *giving detailed information on the construction, operation, testing and servicing procedure* of fourteen commonly used flight and engine instruments with step by step illustrations of procedure. One chapter devoted to the general technique of instrument repair and testing. Price $2.00, postage prepaid.



INSTRUCTIONAL WALL CHARTS

Set of nine 24" x 36" wall charts with illustrations showing the operation and a description. Covers the following: Sensitive Altimeter, Direction Indicator, Air Speed, Vertical Speed, Manifold Pressure Gage, Centrifugal, Magnetic and Electric Tachometer and Electrically Heated Pitot-Static Tubes. Price $1.00 per set, postage paid.

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Enclosed find $_____ for which please send

_____Instructional Instrument Panels at $1.00 each

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ing was a comparatively small business. When the war started, companies already in the field were unable to expand fast enough to meet the accelerating demand. Herbert G. Mayer, the late president of Reliance Manufacturing Company — a large manufacturer of shirts, work clothing and women's dresses—decided that his company ought to make parachutes. Since Pearl Harbor he has made his company into the world's largest parachute manufacturer.

The resulting conversion could be entitled "from overalls to chutes." Reliance executives obtained drawings and specifications and produced a sample chute made from colorful rayon originally purchased for women's dresses. Two sample chutes were later made from silk and approved. Today a large share of the nation's parachutes are turned out in Reliance's Victory and Liberty plants in Washington, Ind., a small town of 12,000 population in the southern part of the state.

Nylon material for life-saving or escape chutes is issued by the Government. It rolls into town in sealed freight cars and is transported to the factories in guarded trucks. Actual work begins at Victory factory where the nylon fabric is cut into 96 pieces, the number necessary to make a canopy. The canopy itself is one of the four primary parts of a chute, the suspension or shroud lines, harness and pack being the others.

A standard flat circular 24-foot parachute consists of 24 panels or gores. Each panel is made of four separate pieces of cloth—hence the 96 total. Sixty-five yards of nylon, enough to make approximately 250 pairs of women's stockings, go into the umbrella-like canopy of a 24-footer.

The panels are cut on the bias with the lengthwise threads of the material running at a 45° angle to the center-line of the panel. The bias cut increases the elasticity of the cloth and enables it better to withstand the strain of the opening shock. It makes it impossible for a rip or a tear to run more than a few feet before being halted at a seam and by coincidence enables a manufacturer to turn out more canopy for each yard of material.

The actual cutting is done by men operating motor-driven machines about the size of a patented cake mixer. They guide their wheel-mounted cutters along markings previously made by brushing powder over pattern perforations. A disc cutting blade knifes through the 200-ply material. The 200 thicknesses, 32 yards in length and 36 inches in width, are sufficient to make 100 chutes.

"Two-needle girls" perform the first operation after the cut material has been transported to Liberty plant where all Reliance escape chutes are made. The girls operate two-needle sewing machines and their task is to sew the four pieces of each panel together. As the sewing is being completed it undergoes its first inspection (there are 33 inspections in all) at the hands of inspectors who have taken their places, one behind each sewing machine. Any errors are easily spotted since the inspectors work over illuminated glass panels. The seams which join the four sections are full-felled (four thicknesses of material folded together and sewn).

Operation No. 2 calls in "four-needle girls" who join each panel with four-needle machine stitching. Their work also goes to inspectors who work over illuminated tables.

The panels are sewn under a uniform tension in order that the threads will not break when the canopy fills with air and stretches taut. The seams run from the skirt (the lower or bottom part of the canopy) to the vent (the opening in the top) and also are full-felled. A channel for the suspension or shroud lines runs between the inner rows of the four-needle stitching.

The lines are inserted by what looks like a large football lacer. Suspension lines are made of nylon and woven much like a round shoe-lace to give them strength and elasticity. Also for strength, the lines (12 in a 24-foot parachute) are continuous from one side of the canopy to the other. Lines are cut while under 20-pound tension to make certain that they are the same length.

They are not threaded into their positions, however, until one-inch tubular webbing is sewed on at the vent. One-inch nylon basting also is made fast on the bottom hem, line reinforcements are made and the chutes get a third check-over before the "stringing" operation.

Zig-zag stitching, performed on what lines are tied into a D-shaped ring which might be called "crazy needle" machines, does the reinforcement work at the points where the lines enter the channels and where they emerge at the skirt. Trick sewing of a "V" distributed the strain at the skirt to three points rather than one. The tape bordering the hem is capable of withstanding 280 pounds and that at the vent, 3,000 pounds.

Once the lines are inserted and made fast at the vent and skirt—they are free elsewhere in the channels—they get another inspection. This time they are checked by "washers" who erase any soiled spots.

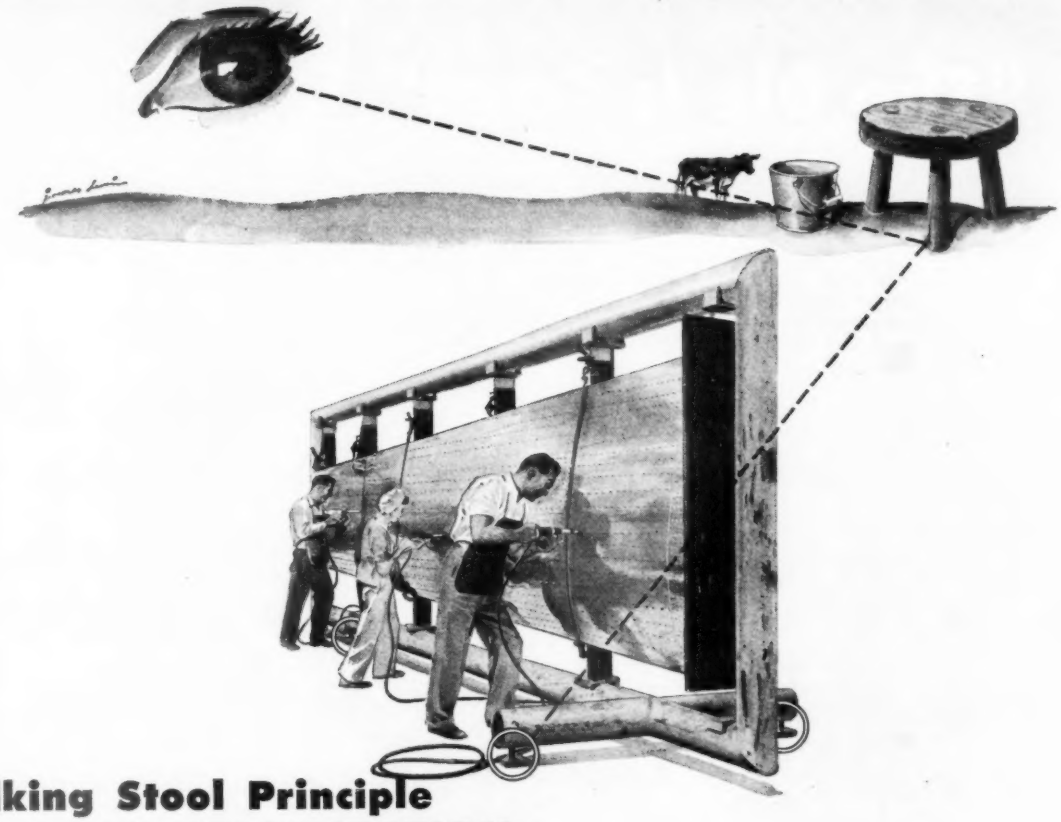
At this point the chutes are given a semi-final check-over after the shroud lines are tied into a D-shaped ring which eventually will join the lines to the risers. The suspension lines, to attach the canopy to the risers, are divided into four groups of six lines each on a 24-foot chute. Each group of lines is laced into the link or "D" ring at the end of each of the four risers, the risers being the four straps, two in front and two in back, which rise above the jumper when the chute is open.

Company inspectors review the lines and check the "D" link knots which are not unlike those tied on hammocks. Then

(*Continued on page* 106)

"That guy just can't forget his great-grandfather was Captain Kidd."

RYAN PRODUCTION ENGINEERING DEVELOPMENT NO. 521



Milking Stool Principle solves JIG STABILIZATION

For years engineers endeavored to develop aircraft production jigs simple in construction, capable of being easily moved without the necessity of being realigned, and having inherent stability so as to assure complete accuracy throughout the entire period of use.

Knowing that any production fixture is no better than its base, Ryan licked the jig problem by using the engineering principle of the ordinary three-legged farm milking stool which remains rigid even though sitting on an uneven surface.

In similar manner, Ryan engineering and production methods are constantly solving the problems that daily harass or delay fast, economical production of warplanes and aircraft assemblies. The ingenuity and "know-how" that has made this great organization a production instrument to be reckoned with in war is your guarantee of skillful, economical postwar operation.

THE PROBLEM

Production jigs with multiple supports, that use the floor as a base, invariably get out of alignment. Such fixtures are difficult to work around, often have to be taken apart in order to remove the completed assembly and require constant realignment. A permanent, stable fixture which would maintain accuracy seemed impossible.

THE SOLUTION

Ryan tooling experts employed the simple engineering principle of the milking stool — the three legs of which always gave a rigid seat irrespective of whether they had a level base or not. They reasoned, why not make three-legged jigs which would be independent of the floor?

THE ADVANTAGE

An inherently stable jig which is aligned at ALL times. No delays in production caused by working with complexly constructed fixtures. No waste of taxpayers' money constructing special foundations. No waste of time "backtracking" production...the result of expanding around certain fixtures rather than move them. Tool designers of other warplane factories have been given access to full information on Ryan's unique three-point jigs.

RYAN

RELY ON RYAN TO BUILD WELL

Ryan Aeronautical Company, San Diego — Member, Aircraft War Production Council, Inc.

1922 – 1944 **Designers and Builders of Combatant Type Airplanes and Exhaust Manifold Systems**

Plutarch has recorded Caesar's fateful decision to cross the Rubicon on his historic march to Rome: "The die is cast", he said . . . and gambled all on a blitzkrieg. Caesar won — Hitler didn't!

America has learned from each, and our guiding principle is to work for an early knockout but to prepare to win a long war. That goes for industry as well as for the fighting forces.

The die is cast at Solar to uphold America's principle and Solar workers have taken this decision to heart — adding thereby a priceless quality to brawn and skill. The tangible results are seen in new and revolutionary die-castings, constantly improving the quality of Solar airplane exhaust systems made of stainless steel. Production is at high peak, although stainless steel — perfect for the finished job — is tough on forming dies. Solar people do first things first, but prepare for the long haul . . . even looking ahead to brighter days and postwar stainless steel products, bearing the Solar trademark.

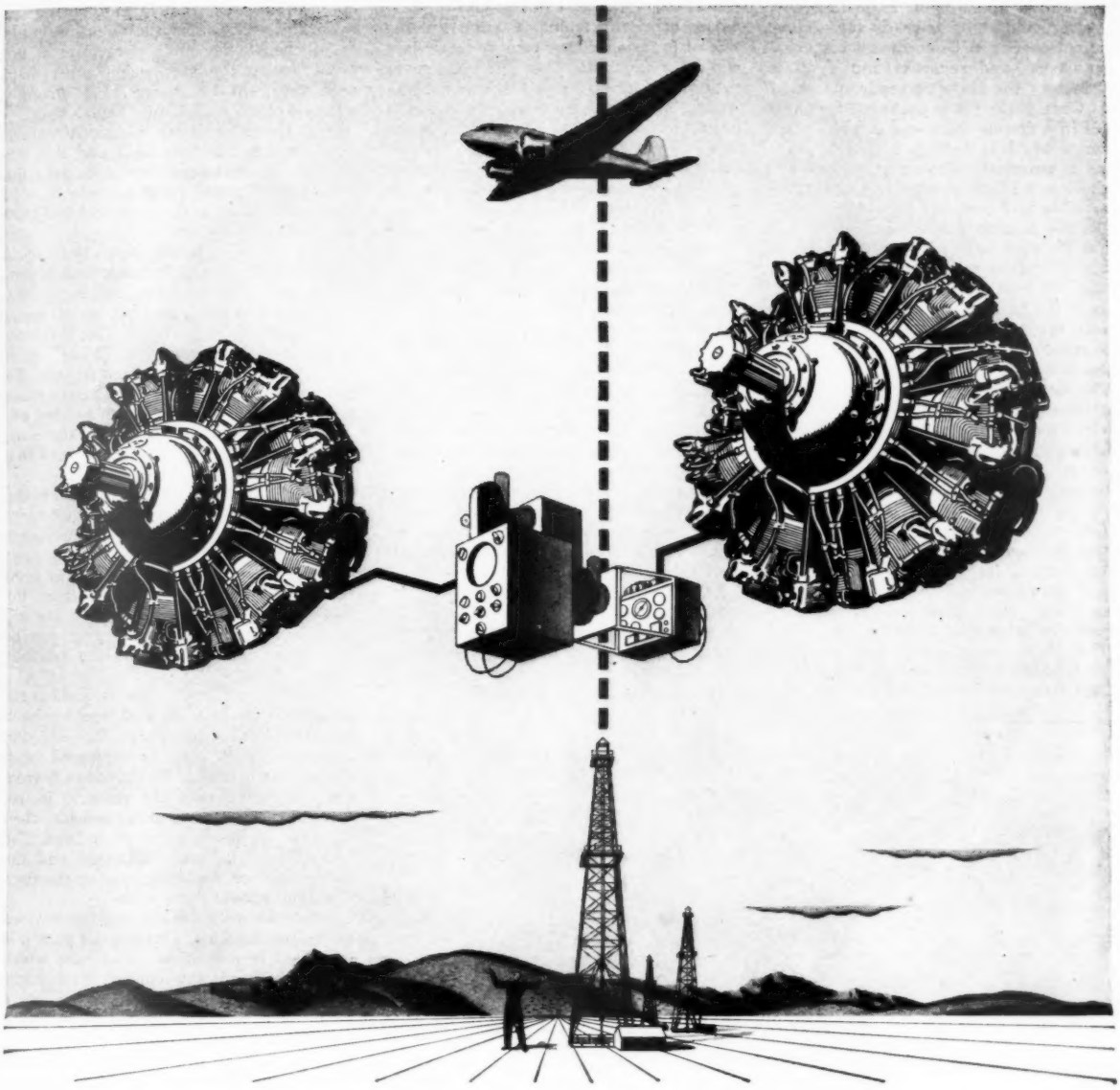
ARMY E NAVY

SOLAR

STAINLESS STEEL PRODUCTS

SOLAR

SOLAR AIRCRAFT COMPANY ★ SAN DIEGO 12, CALIF. ★ DES MOINES 5, IA.



Petrolectronics writes history in the sky

She looked like any other United Mainliner; but only on the surface. Inside she was a flying test tube; a compact laboratory in space. Aboard her, engineers from Standard of California and United Air Lines were seeing, for the first time, what went on *inside* aircraft engines in flight.

"Petrolectronics," the application of electronic instrumentation to petroleum research, made it possible. Standard's own electronics laboratory supplied many of the instruments which recorded combustion-chamber pressures, cylinder temperatures, and fuel-air ratios; analyzed exhaust gases; checked fuel performance and consumption under varying flight conditions.

For United Air Lines, the tests revealed that leaner carburetor settings *safely* increased fuel economy 8% to 15%, that a certain type of spark plug eliminated preignition, that the grade of fuel selected powered their engines efficiently.

For Standard of California scientists, this pioneer of all completely instrumented power-plant flight tests led to new fields of research—and the tremendously powerful Standard Aviation Gasoline of the present. But Standard petrolectronics hasn't stopped there. It's giving our aviation fuel more fighting punch today—and finding new ways to make it useful in the blueprinting of more efficient aircraft for tomorrow.

STANDARD OF CALIFORNIA

they flash a green light, indicating that the completed chute is ready for a Government check. A Government inspector then checks and rechecks and if all is satisfactory the chute is ready for packing. Once packed it is packaged for shipment in a double thickness of paper, one layer of which is water proofed. If something is wrong the Government man will flick on a red light above the long inspection table and company trouble shooters make the necessary alterations.

For the most part, parachute harness is made of cotton webbings with a nylon filling. At points where additional members of the harness join, stitches run vertically, diagonally, and horizontally. Ends are paraffined to prevent fraying. The harness itself is adjustable.

The design of the harness varies with the type of pack and the pack, in turn, varies somewhat with its type and whether it is to be opened automatically or with a rip cord.

Seven steps, performed solely by men, take the harness to the finished stage where eight thicknesses of the 1¾-inch cotton webbing, capable of withstanding 4,000 pounds, fasten onto the pack "D" rings. In the course of various harness inspections each piece of webbing is checked to withstand 2,900 pounds.

The U. S. Army seat, chest or back pack type parachutes, considered typical of the free type parachute, consists of a canvas case, the body made semi-rigid by means of a wire frame. On the opening side of the pack there are four large flaps which, when folded into position, cover the contents completely. Stiffeners are inserted into one pair of the flaps to perform much like corset stays. On the inside bottom of the pack are two rows of elastic loops which, because the parachute goes into the pack in the reverse order of that in which it emerges, hold the suspension lines in place, preventing their fouling and allowing them to slip out easily as the canopy catches the wind.

All raw edges of the pack are bound with stout tape and flap corners are turned in to form little pockets into which tools are inserted to facilitate packing.

Twenty-three steps, the first of which is the making of one of two pockets which carry the chute's identification, service, test and repair record, go into the making of the pack. The toughest single operation in parachute manufacturing comes midway in the pack job when hand-sewn elastic is placed for the rip cord handle. The elastic must be centered properly, sewed into a cone of the proper size and well balanced.

Pilot chutes, 36 inches in diameter, are made from a single piece of material. Cut in octagonal shape, four pieces of cotton strapping are sewed to the inside, one to each point. Pockets on the strapping hold metal frames in place and it is these frames that cause the chute to spring out when the pack is opened. The pilot chute is attached to the main parachute at the point where the suspension lines meet over the vent by means of a strongly stitched circle called the "bridal knot."

It is the pilot chute, naturally, which first emerges from the pack and it is the pilot chute, therefore, that goes into the pack last. Special flaps provide it with separate lodging in the pack and facilitate its spring into the air.

As for the opening operation of a packed chute, one of the pack flaps is provided with two or more locking cones, these being cone-shaped pieces of metal with an eye near the peak. The three remaining pack flaps have either metal grommets or ring tabs, which fit over the cones as the pack is closed. The rings are held in position by a two-inch locking pin which passes through the eye of the cone. Each locking pin, in turn, is fastened to a flexible metal cord—the rip cord.

At one end of the rip cord, then, is the pin; at the other end is a metal grip large enough to take a gloved hand. The length of the cord itself depends upon the position in which the pack is worn. On front packs only the grip emerges from the flaps. On seat and back packs the rip cord is longer so that the grip can be located at the left side of the harness, chest high.

Once the rip cord pin is pulled the parachute must be released from the pack completely and instantly. To expedite this each pack flap is equipped with strong elastic cords. The cords pass from the locking edge of the pack to its reverse side, and, being under tension when the pack is closed, serve as springs. The instant the rip cord is pulled and the cones are free, the elastics snap the flaps open and spread them wide.

Inside the pack the rip cord is protected by its own housing. Outside the pack it is protected in a flexible metal tube which shields it from any contact that might accidentally release the parachute. As a final safety factor, once the parachute is packed and locking pins are inserted in the cones, they are tied in place by a break cord. Although not a strong cord, it will not snap until the rip cord is pulled. Thus any small jar or jerk is prevented from pulling the locking pin out of the eye.

When the parachute is the automatic type the opening is a slightly different problem. In this case the static line which connects the chute to the plane is folded into holders on the outside of the pack. The pack is closed by fitting the cover into the opening provided for it in an oblong canvas pack. The cover is fastened by lacing which runs through metal eyes on both the cover and the pack. The static line is attached to the pack in such a way that when the man jumps the strain of his weight is put on the lacing. His weight breaks the lacing and releases the cover, thus permitting the canopy to be pulled out.

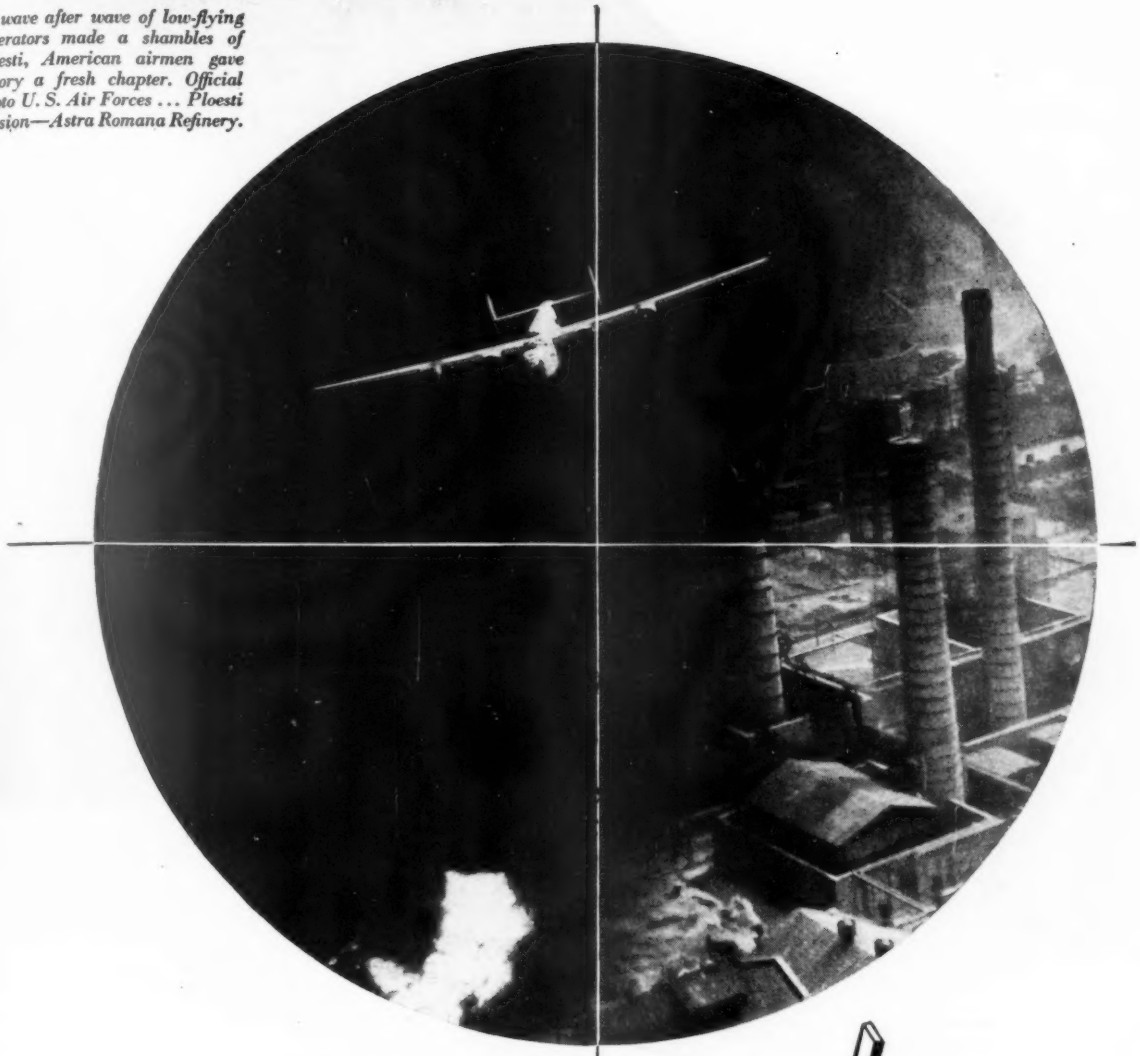
To insure perfection in the completed and packed chutes the Army requires that all manufacturers test-drop a percentage of each contract run. If one in a

(*Continued on page* 110)

"The heck it is! It's a P-47D-2-ZL!"

FLYING

As wave after wave of low-flying Liberators made a shambles of Ploesti, American airmen gave history a fresh chapter. Official Photo U. S. Air Forces ... Ploesti mission—Astra Romana Refinery.



. . . AT THE FUTURE "PLOESTIS"

EVERY red-blooded American hopes for many more headlines that shout "Mass Raid by American Liberators." Every solid punch these heavyweight fleets drop on enemy targets . . . every future "Ploesti" . . . is possible only through the courage and skill of the American kids that fly them, and the unceasing work of free American craftsmen who build them.

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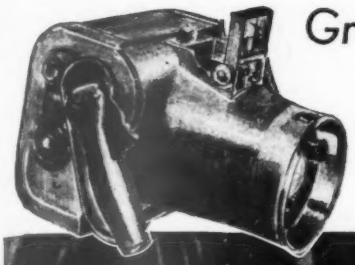
DOAK AIRCRAFT COMPANY, INC.
TORRANCE, CALIFORNIA

WORKING AROUND THE CLOCK FOR A BRAVE NEW WORLD



Great Pictures of the War . . . made with Fairchild CAMERAS

Official U.S. Navy photograph

An old story to camera fans is the above famous Pearl Harbor picture. But surprising news to most folks is that it was made not with a standard *still* camera . . . but with a Fairchild precision *aerial* camera!

Action shots on land and sea, as well as from the air, are made with Fairchild cameras. Why? Because no matter how swift the action . . . no matter how far from the photographer it may recede . . . the Fairchild camera still gets accurately detailed close-ups.

With focal lengths up to 60-inch, Fairchild cameras could make recognizable shots of your living-room furniture from two miles up . . . and do it in the black of night as well as in the light of day.

These are the reasons why many great pictures of the war, on land and sea too, are made with Fairchild precision aerial cameras.

Destroying Jap planes in Marianas Islands — a Ziff-Davis Pub. Co. photo — one of a series also taken with a Fairchild Aerial Hand Camera.

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THE STORY OF AERIAL PHOTOGRAPHY IS THE STORY OF FAIRCHILD CAMERAS

(*Continued from page* 106)

test lot is found to be imperfect a greater percentage of parachutes are tested. Early in America's expansion for war it was required that all parachutes be tested. Faced with this requirement, Reliance was forced to build an airport over which to conduct the tests. A field was completed and a local flyer was equipped with two planes. Chutes, then made of silk, were dropped and opened successfully—yet a good number were rejected by military inspectors.

The rejections were laid to grasshoppers. Grasshoppers, it seems, found the white silk ideal targets for "tobacco juice" marksmanship once the parachutes floated to the ground.

An anti-grasshopper squad corrected that difficulty. Now, when test-dropping is in order, a skilled pilot who rarely misses a 50-foot area with the chute, makes it possible to retrieve the parachutes before the canopies strike the ground.

For test purposes two chutes are made fast on the outside of the plane and released at 500 feet. The pilot is able to test 20 to 30 parachutes per hour even though he returns to the field after each pair of chutes is dropped. Testing of chutes is done largely by Rudolf at Reliance, Dummy Sam at Wright Field, Oscar at Fort Benning and Buck Private Dummy at Randolph Field — dummies without heads and arms and with only part of their legs.

Because subtle problems such as: what causes a parachute to turn inside out and why suspension lines become misplaced, cannot be answered by dummies, other means of testing must be sought. Experiments were staged with wind tunnels but did not prove satisfactory. Today testing towers with a swing boom are being tried. High speed cameras attached to the end of the boom photograph actual tests and results are studied later by projection.

The ultimate parachute pack is yet to come. Experiments with a garment pack point, perhaps, to the possibility of styles for the future. The experimental garment pack, designed to relieve gunners working in big military planes of the discomfort and weight of the conventional pack, consists of a strongly reinforced flying suit or flight jacket. With the harness built in and the chute canopy folded into a minimum of space over the back, it not only would provide the wearer with a cushion but with additional warmth.

Numerous other improvements are forecast. Parachutes best suited for high altitude work will be devised. A tear-proof fabric is being developed which will far surpass anything now in use. END

The Ace Business

(*Continued from page* 27)

enemy planes to his credit. This is not as fantastic as it may seem. When Bong returned from the Southwest Pacific recently, he said that if he were an expert at deflection shooting instead of "a poor shot" he could have bagged 75 Japs instead of 27.

Behind Pokryshkin among the Soviet aces are Richkalov (46); Glinka (38); Lugansky (32) and Alelyuhkin (29). It is not exactly known, however, on what basis Russian kills are accredited.

What makes an ace and how did the ace race get its start?

World War I is the answer. Someone—no one seems to know who—decided that any pilot who could shoot down five enemy planes should be designated an ace. That standard has no official status with the Army, Navy or Marines. It's what one Navy man called a "newspaper" standard.

World War I lent itself to aces. Because of the pitifully small air forces in existence at that time, circumstances made for individual performances. Teamwork, now the very heart of successful aerial warfare, was less essential then. Aerial tactics of 25 years ago produced such men as Rickenbacker and Richtofen. Rickenbacker became the nation's No. 1 hero in 1917-18 by accounting for 26 German aircraft (including blimps).

When World War II got under way, the natural impulse was to keep a sharp lookout for the man who could better Rickenbacker's record. First came Lieut. Col. "Buzz" Wagner. The first U. S. ace of World War II had eight Japs to his credit when he was killed. Then came Butch O'Hare, who became an ace in the battle which saved the *Lexington*. Then came the others—and the race was in full swing.

After that some officials began showing signs of concern. Readers were being surfeited with columns about individual air performances in an air war where the emphasis is on teamwork. Concern springs from the fear that the public will construe modern warfare as one of individual achievement—which it very definitely is not. But it goes deeper. There is the effect such publicity will have on the morale of the unsung airmen.

Not that the obscure pilots resent the front-page heroes. As a rule, they do not. They resent the system which makes the individual score the important thing.

For this reason, the Army, Navy and Marine Corps shy away from the tendency to set up individual heroes. They keep official records, but not individual boxscores. Rather, they place the stress on squadron performances.

In China, for instance, Lieut. Gen. Claire Chennault forbade the publication of individual pilot boxscores. It's all right to talk or write about the overall record of the 14th Air Force, but publicizing individual performance is taboo.

This ace business can create a good deal of controversy, too. Witness the debate

(*Continued on page* 115)

Need a Motor that can lift 500 times its own weight?

THIS electric motor weighs only a pound. But more power is packed in that one pound of motor than has ever been before.

With Lear gearing it can handle a quarter-ton load.

And it has to be ready to do that in an instant. Because this motor moves control flaps, and heater shutters on warplanes. And air pressures mount high at the speed these ships fly.

On aircraft, even the weight of a coat of paint has to be considered. So this motor had to be light.

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Designing it meant starting from scratch. There was no precedent for this kind of engineering.

You may never need a motor like this. It may cost more than you might want to pay.

But if you are looking ahead toward manufacturing some peacetime product, we want you to know that such a motor has been developed along with 250 other Lear products.

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There's a big difference of opinion about speed. Our Aircraft Quiz has brought that out from hundreds of the flying enthusiasts who've sent in their Quiz returns. Some believe in "speed at any price"—others prefer to compromise a little on speed for the sake of greater efficiency, added safety, more range. How do *you* vote?

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But that isn't all. Many other Bellanca features will be in line with popular demand. Engines, landing gear, range, seating, construction, capacity and other essential factors that are covered in our Aircraft Quiz are now being voted on, *Yes* or *No*, by men and women all over America—by many in far-distant places, serving with the Armed Forces—who are checking off their answers on this popular Quiz. In this helpful way, you can let us know what *you* want *us* to build for your post-war flying.

Why don't you send for this Quiz today? Just give us your name and address—we'll mail you the Quiz, and later you'll receive our report on all returns, so you can compare your answers with thousands of others. Write us now! ...Bellanca Aircraft Corporation, Dept. S-1, New Castle, Delaware.

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"In carrying a 200-lb. passenger on a round-trip schedule from Chicago to New Orleans, the revenue to us would be $93.28. Translated into per pound revenue, this is approximately $.50. If we save one pound each day throughout the year, the saving would amount to $180.00. We are very much interested in the post-war use of Boots Self-Locking Nuts. Through their application on Chicago and Southern planes we will be able to capitalize their pronounced weight-saving characteristics."
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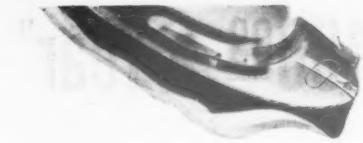
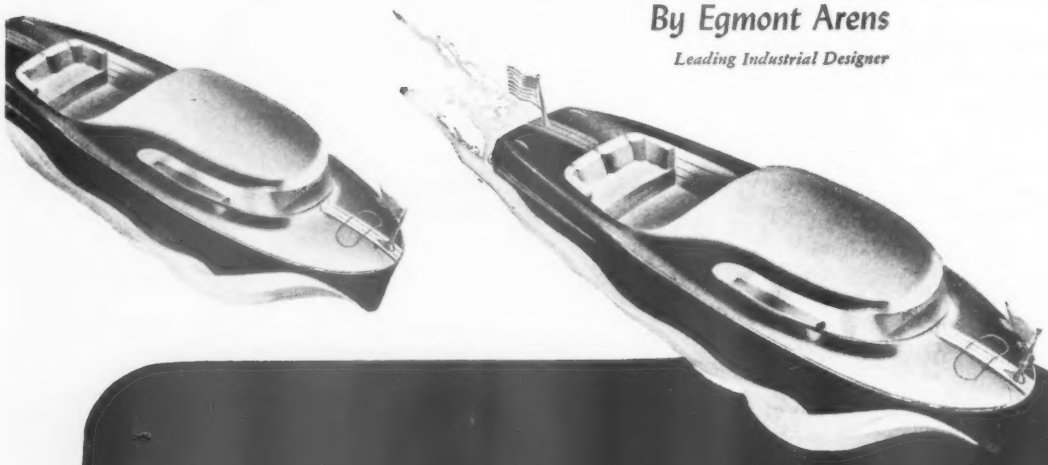


I PREDICT . . .

By Egmont Arens

Leading Industrial Designer



I predict quantity production, right after the war, of unsinkable boats with continuous skins, tougher and lighter than wood, hull and top sides molded in one piece of Co-Ro-Lite, a new molding material consisting of plastic bonded rope fibres. Scale models of such boats are now being tested under a variety of conditions, and hulls of similar construction up to 32' have already been successfully molded. Light weight, speed and low cost will be overall outstanding features. The skin-stressed monocoque construction produces a light weight hull and top. An aluminum aircraft-type engine, housed out of the way in a small space under the aft deck, will provide speed and low operating expenses. Production by molding assures low initial cost, and a one-piece hull, eliminating yearly overhaul and caulking, means low upkeep. Thus motor-boating will be a pleasure everyone can buy with their War Bonds when Peace is restored.

* * *

Note: The Weatherhead Company, one of the oldest and most important manufacturers of parts for the aviation, marine, automotive and other key industries, looks forward to the day when its four plants will be contributing to peacetime needs.

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(*Continued from page* 110)

in the prints after Gentile was credited with 30 kills. Some screamed loudly because seven of Gentile's kills were parked enemy planes—ground kills, as they are called. Some insisted that if ground kills were to be counted, then the late "Buzz" Wagner would have had about 60 Jap planes.

Whatever the merits of the arguments, many flyers contend that fighter pilots who skim in over enemy airfields to destroy parked planes take a greater proportionate risk than they do in aerial dogfights. They argue that the danger from antiaircraft fire justifies the counting of ground-destroyed planes inasmuch as a pilot has a better chance of saving himself if something goes wrong at 20,000 feet than if he is at 300 feet, where the slightest miscalculation means doom.

Ground kills are highly important. When Gen. Henry H. Arnold released a boxscore of Army Air Forces accomplishments last May 18, he included in the overall total of 20,174 enemy planes destroyed since Pearl Harbor 3,664 enemy planes destroyed on the ground. His tabulation made it plain that the important thing is to destroy as many enemy planes as possible—regardless of the method (in combat or on the ground).

This raises the question: how are kills determined?

An official War Department announcement of May 7, 1943, gave these rules:

"There are only three circumstances in which an enemy plane is definitely counted as lost.

"These are: (1) If the plane is seen descending completely enveloped in flames; (2) If the plane is seen to disintegrate in the air, or the complete wing or tail assembly is seen to be shot away from the fuselage; (3) If the plane is a single-seater and the pilot is seen to bail out.

"Enemy aircraft are not counted as having been destroyed on the basis of the fact that flames are licking out from the engine or a wheel; or some other similar part of the plane is seen to be shot away.

"After each combat mission, every fighter pilot and member of a bombardment crew is interrogated by intelligence officers. When any crew member claims having shot down or damaged an enemy plane, he is questioned about all pertinent details. He is questioned also about claims of other crew members. After the briefing is completed, the intelligence officers make a composite breakdown and their official reports are on the conservative side.

"Taken into consideration by the commanding and intelligence officers are the following: The number and type of enemy planes attacking; the direction and angle of attacks; the range at which the gunner is believed to have opened fire and the distance at which he believes he destroyed the plane; the rounds fired and the results; the time, place and altitude of our planes, and their positions relative to other factors.

"A plane is counted as having been probably destroyed if it is believed to be sufficiently in flames to preclude the chance of extinguishing the fire, or when damaged to the extent where it is believed it must have crashed, but where there is not 100 per cent certainty.

"A plane is counted as having been damaged when parts are seen to be shot away.

"The commanding and intelligence officers, in analyzing the claims, are cognizant that as long as the enemy has a plane in the air, some skeptics will doubt the accuracy of the claims of enemy planes destroyed. Consequently the first thought of the officers is to eliminate duplicate claims. They do so whenever there is any doubt.

"The officers in the South and Southwest Pacific have a less difficult problem in this regard because of the structure of the Japanese Zero plane. If it is hit right, the Zero explodes and there is no question that another enemy aircraft has been destroyed."

These rules apply in general to the Army, Navy and Marines.

A high RAF spokesman in Washington is authority for the statement that the British system for determining kills is similar to that used by American Air Forces. In fact, the United States borrowed from the British system.

In recent months, more planes have been equipped with cameras which eliminate nearly all uncertainty as to kills. The camera not only provides incontestable evidence, but it performs another important function. With modern aerial warfare geared to such high speeds, a pilot gets an enemy in his sights for scarcely one second. Then, especially if the fighting is furious, he has only a split second to see what has happened to his adversary. That split-second leaves room for error. But the camera makes no mistakes about the exact fate of the enemy.

There is another controversial sidelight to this air ace business. A frequently-asked question is whether it is easier to bag Japs or Germans. The answer is that neither is easy. General opinion is that the Zero, with its lack of bullet-proof tank, comparatively poor armor plate and relatively inferior pilot, is a surer target than the German. There is also agreement on another point. The lead that comes at you is just as dangerous and destructive—whether German or Japanese.

Here is an all-star lineup of U. S. aces so far in this war:

ARMY

Capt. Don Gentile, 23, of Piqua, Ohio, with 30 German planes credited to him (seven of which were destroyed on the ground). He is the only *Mustang* pilot listed among the top flyers.

Capt. Robert S. Johnson, 24, of Lawton, Okla., with 27 German planes shot down. He flew a *Thunderbolt.*

Maj. Richard I. Bong, 23, of Poplar, Wis., with 27 Japanese planes shot down. He flew a *Lightning.*

Maj. Walker Mahurin, 25, of Fort Wayne, Ind., who is credited with 21 kills. He flew a *Thunderbolt.*

Lieut. Col. Boyd D. ("Buzz") Wagner, 26, of Johnstown, Pa., with at least eight (and some estimate as many as 50) Japs to his

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credit. Before he was killed in a routine flight from Florida to Alabama late in 1942, Wagner was an almost legendary figure in the war in the Pacific and was one of the first great U. S. aces to come out of the conflict.

Col. Neel E. Kearby, 32, San Antonio, Tex. This *Thunderbolt* pilot bagged 21 Japs before he was reported missing in March.

Lieut. Col. Thomas J. Lynch, 27, of Catasauqua, Pa. Flying a *Lightning*, he shot down 20 Japs in the South Pacific before he was killed over New Guinea last March.

Other leading army aces include Lieut. Col. Francis Gabreskie of Oil City, Pa., with 20 kills (two on the ground); Col. Glenn Duncan of Houston, Tex., with 17 (one of them on the ground) and Col. David Schilling of Detroit with 15. All three have been flying the tough European skies.

Marines

Maj. Joseph J. Foss, 29, Sioux Falls, S. D. Flying Grumman *Wildcats*, he was the first American pilot to equal Capt. Eddie Rickenbacker's World War I mark of 26—which is Foss' high mark.

Maj. Gregory Boyington, 31, of Okanogan, Wash. He reached the magic 26 and then was reported missing over Rabaul last January and has not been heard from since. He flew *Warhawks* in China and *Corsairs* in the Pacific.

Lieut. Robert M. Hanson, 23, Newtonville, Mass., brought down 25 Japs before he was killed Feb. 3, 1944, near Rabaul when his plane, a *Corsair*, crashed during a strafing run.

Capt. Don N. Aldrich, 26, Chicago. He is credited with 20 kills against the Japs as a member of Hanson's *Corsair* squadron.

Capt. Kenneth A. Walsh, 29, of Washington, D. C., who has bagged 20 Japs, four of them in a single-handed battle against 50 enemy planes for which he received the Congressional Medal of Honor.

Navy

Lieut. (j.g.) Ira ("Ike") Kepford, 25, Muskegon, Mich., whose "Skull and Crossbones" squadron is credited with at least 154 kills, of which Kepford has accounted for 16.

Lieut. Comdr. Edward H. ("Butch") O'Hare, 30, of St. Louis, who shot down 12 Jap planes before he was lost on the Gilberts' invasion. Most important of all his feats, perhaps, was his single-handed defense of the since-sunk aircraft carrier *Lexington* on Feb. 20, 1942, when he shot down five attacking Japanese bombers, severely damaged a sixth and dispersed the other three.

Lieut. Comdr. J. T. ("Tommy") Blackburn, 32, of Chevy Chase, Md., commanding officer of the "Skull and Crossbones" squadron, who has shot down 11 planes.

Lieut. (j.g.) Hamilton ("One Slug") McWhorter, 23, of Athens, Ga., who has shot down 10 Japs in recent Pacific battles. He is known as one of the "Dead-Eye Dicks" of the Navy and comes by his nickname "One Slug" because he uses a minimum of ammunition to put an enemy plane away.

Lieut. Comdr. Stanley Vejtasa, 30, of Circle, Mont., considered by many the Navy's outstanding fighter pilot during the first phase of the Pacific war, has shot down 14 Japs.

From the foregoing, it can be seen that Navy aces trail far behind Army and Marine pilots in individual scores. Chances are that no Navy pilot ever will shoot down as many enemy planes as his Army or Marine counterpart because virtually all Navy pilots are carrier-based and their opportunities for contact with the enemy are considerably less than in the case of land-based flyers.

The limited number of Navy pilots in the air ace hall of fame in no wise implies that the Navy does not have its share of aces—aces in the sense of pilots whose achievements may not grab the big headlines but who nonetheless have made important contributions to Naval aviation.

There are, for instance, such men as Comdr. John S. ("Jimmy") Thach, 29, of Fordyce, Ark., Comdr. Dewitt Shumway, 34, of Syracuse, N. Y., Lieut. Comdr. Harold H. ("Swede") Larsen, 33, of Collingswood, N. J.; Comdr. Leroy C. Simpler, 39, of Harbeson, Del.; Lieut. E. Scott McCuskey, 29, of Stuttgart, Ark., and Lieut. Comdr. W. J. ("Gus") Widhelm, 36, of Humphrey, Nebr.

Thach, for example, is outstanding for his contribution to the evolution of fighter tactics, including the so-called Thach weave—a maneuver by two planes which, scissoring on each other's tail, assures the highest measure of protection to both. Yet, if you gauge your heroes by boxscores, Thach has shot down only seven planes.

There is no record of the number of planes Shumway has shot down. But the dive bombing squadron which he leads is credited with having destroyed more Jap materiel and personnel than any other squadron in the first phase of the Pacific war.

Nor is there any high-powered headlining of Simpler's achievements. Yet his leadership of a fighting squadron is credited with playing a vital role in repelling the desperate Jap aerial counter-offensive against Guadalcanal. His squadron—Fighting Five—destroyed 77 Jap planes over Guadalcanal, with 13 probables.

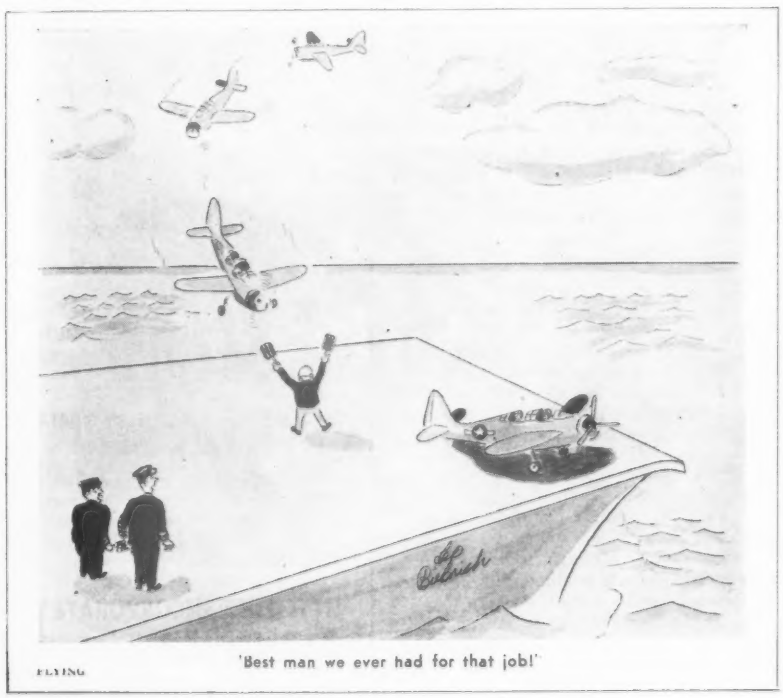
Then there is Larsen. He took command of the "new" Torpedo Squadron Eight after the original squadron was wiped out almost to a man in the Battle of Midway. It carried out 40 attack missions, 17 against ship targets, 23 against ground targets. It torpedoed one battleship, five heavy cruisers, four light cruisers, one destroyer, one cargo ship and two carriers and bombed one heavy and one light cruiser.

McCuskey has shot down at least eight enemy planes. But, perhaps more important, he is a foremost fighter tactician and many of the pilots now running up good scores in the Pacific have McCuskey's training to thank.

And there is Widhelm. An outstanding tactical leader of dive bombing squadrons, his Bombing Eight (The Bombing Fools) can't show an imposing record of enemy planes shot down because that is not their primary business. But part of the glory for the historic victory in the Battle of Midway certainly belongs to Widhelm and his boys.

The headlines tell only part of the story—a small part. The public must have its heroes, so you read about the air aces.

But the unpublicized pilot and the grease-stained member of the ground crew must not be forgotten. When victory comes, it will be teamwork that brought it. END



FLYING 'Best man we ever had for that job!'

'bolt from the blue

Swooping down out of the heavens, this "Thunderbolt" makes a feather-light landing because the shock is effectively absorbed by Aerols.*

The Republic P-47 "Thunderbolt" is only one of many present-day military aircraft that are Aerol equipped. After victory, in tomorrow's age of flight, peacetime planes will also rely on Aerols for safe, smooth landings and swift, sure take-offs.

THE CLEVELAND PNEUMATIC TOOL CO.
AIRCRAFT DIVISION • • CLEVELAND 5, OHIO
Also Manufacturers of Cleco pneumatic tools, Cle-Air shock absorbers for vehicles and Cleveland rock drills for mining and construction.

Buy U. S. War Bonds and Stamps

This advertisement is one of a series which is appearing in national magazines and newspapers as Consolidated Vultee's contribution toward a clearer public understanding of transportation's role in the war, and its postwar opportunities and responsibilities.

4 days out—4 days back—and the weather be damned!

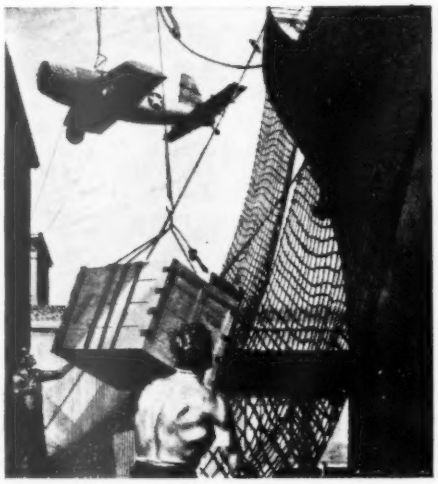
1. **"Tired? I'll say I am!** You'd know, if you'd ever flown a 200-mile-per-hour cargo plane in from the Orient for the Air Service Command." He was only 22 years old, this Liberator Express pilot. He'd just brought his ship in — the end of a round-trip run on the longest air-freight haul in the world. From India, 14,000 miles away, to Patterson Field, outside Dayton, Ohio!

2. **Day in, day out,** the huge, long-range Liberator Express transports roar down this Ohio runway and streak southward to Brazil's hump, then across to Africa, and on to the very fringe of Jap-held Burma. The boys who fly this shuttle run — in all kinds of weather — call it the 8-day "Pony Express," — 4 days out, 4 days back.

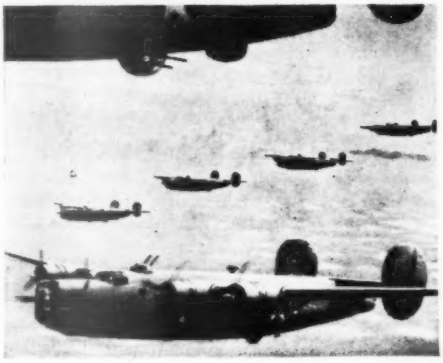
3. **Each Liberator Express** carries many tons of high-priority cargo — aircraft parts and supplies urgently needed by American airmen based halfway around the world. Magnetos, fuel pumps, jungle kits, propellers, starters, aircraft engines, radios, and other vital accessories. "It's a rugged run," the pilots say. "But our combat flyers are doing a terrific job out there — and how they need the stuff we take 'em!"

4. **Dramatic as the India run is,** it's only *one* of the ways in which we're solving the stupendous problem of supply for United States air bases the world over. Every day, thousands of tons of supplies are loaded into freight cars and trucks at huge Air Service Command warehouses scattered over the U.S.A. The furious tempo of Allied aerial warfare calls for miracles of transportation, not only by air, but over highway, by rail, and on the sea.

CONSOLIDATED VULTEE



5. **Boxes and crates,** brought by truck and train, are lowered into the holds of waiting ships. Often, part of the cargo consists of fighter planes which have been flown from factory to dock. Partly dismantled, they are lashed down on girder-like false decks for delivery overseas. Our constant and gigantic torrent of transoceanic shipping is truly a bridge of supply which is taking us closer and closer to Victory.



6. **The plane,** the train, the truck, and the ship must team up together to help rebuild the peacetime world, just as they are working together to win the war. In fact, transportation will be a vital key to postwar peace and prosperity.

But the plane will also have a *second* role to fulfill. For the long reach and overwhelming might of American air power can well become this freedom-loving nation's most effective force for ensuring a lasting peace.

Quick Facts for Air-Minded Readers

New role for the "Cat" — Although designed as a Navy patrol bomber, the Consolidated Vultee long-range Catalina flying boat is also being used as a transport, flying natural rubber out of South America.

• • •

How your War Bonds buy more Bombers — In the 1943 fiscal year Consolidated Vultee has made savings of $251,000,000, which have been passed on to the government in voluntary cash refunds and price reductions and reserves for further refunds. This saving came about through new operating economies and efficient use of manpower, which enabled the company to turn out *more* planes for *less* money

• • •

North Atlantic Shuttle — It is reported that flights across the North Atlantic, in both directions, are now running more than 1000 a week.

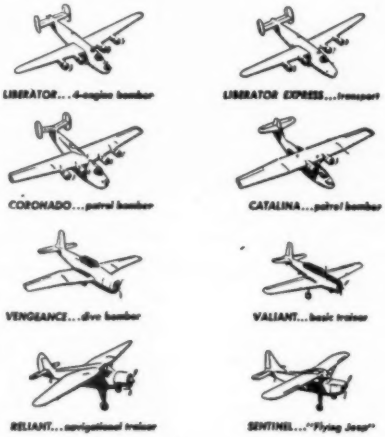
• • •

For Distinguished Service — Though operating with only about half their prewar equipment in '43, the airlines of America flew 37,639,000 ton-miles of mail (*a gain of 78%*) . . . 15,774,000 ton-miles of express (*a gain of 34%*) . . . 1,540,000,000 passenger miles (*a gain of 10%*).

Consolidated Vultee is the largest builder of airplanes in the world.

No spot on earth is more than 60 hours' flying time from your local airport

From "Flying Jeeps" to Leviathans of the air — *The planes shown below were all designed and developed by Consolidated Vultee. When peace comes, the company will be in a position to provide the postwar equivalent of such planes, from small, privately owned "air flivvers" to huge, transoceanic cargo-and-passenger planes.*



AIRCRAFT

San Diego, Calif. · Vultee Field, Calif. · Fairfield, Calif. · Tucson, Ariz. · Fort Worth, Texas · New Orleans, La. · Nashville, Tenn. · Louisville, Ky. · Wayne, Mich. · Dearborn, Mich. · Allentown, Pa. · Elizabeth City, N. C. · Miami, Fla.

Member, Aircraft War Production Council

The Aircraft Factory Goes to Press

(*Continued from page 54*)

articles on proper diet and eating for war workers. *Simpli-Facts* is compiled by the work simplification department and distributed to 6,000 supervisors, with information on work-simplification and time- and money-saving devices.

Boeing's publications are also typical of the big aircraft company's ventures into plant journalism, with weekly issues of the Boeing *News* for each of the divisions and a monthly Boeing *News* magazine with a circulation of 45,000. One thoustand copies are sent to Army camp libraries throughout the country.

The various editions of the Boeing *News* are edited by a large staff headed by Byron Fish, under the supervision of Public Relations Manager Harold Mansfield. There are 10 writers and editors in the editorial department and four in the art department. All pictures are taken by staff photographers. Most of the "news," however, is gathered and written by correspondents in the Boeing plants.

Two weeklies are published for the Seattle and Renton divisions, with monthly replates containing localized news for the smaller Tacoma, Bellingham-Everett and Aberdeen-Chehalis divisions. The Boeing *Magazine*, printed on slick paper, goes to employees of all divisions.

On the policy of the Boeing publications, Fish stated, "We work on the theory of a regular newspaper—that people have to be worthy of the space to make news. We try to be objective without any hip-hooray for the company. Naturally, we point out Boeing's accomplishments, but we present them as much as is humanly possible on their merits."

He added that the Boeing *Magazine*, "which is the farthest from intimate chit-chat," is the one most popular with employees.

A popular cartoon feature of the Boeing publications is the series on "Oxnard and Luna Fumblethumb," a pair of dimwits whose pranks and carelessness make them horrible examples of the assembly line. They have appeared for the past two and one-half years as part of Boeing's safety program. Art Director Keith Kinsman draws the cartoons.

Consolidated Vultee publishes weekly papers for each of its 11 divisions.

The largest, Consolidated *News*, for the San Diego division, has a circulation of 40,000, including 1,000 copies sent to former employees now in the armed forces. It is a 12-page tabloid, published on 45-pound book stock on a rotary press. Each issue contains about 50 pictures and stresses the feminine angle as well as departmental and sports news.

The San Diego division paper is published under the supervision of John L. Tower and has a staff including two reporters, a sports writer, a woman's page editor and a secretary-writer. One feature is a "War Bond Dog House," listing departments purchasing less than 10 per cent of their salaries in war bonds.

Labeled a "Paper for People Who Start 'Em Flying," the *Vultair* is published for employees at Consolidated Vultee, Vultee Field, with emphasis on the activities of the workers who build basic trainers. It is a four-page tabloid, printed on slick paper.

Plane-Talk, a super-slick bi-monthly with color pictures, resembles an expensive brochure and is printed mostly for the "outside," with several thousand copies going to Consolidated-Vultee executives and other personnel.

Tower recently conducted a survey to determine the reaction of employees to their papers and found that they "fill a very important need, both as a medium for distributing information and as a morale builder." He pointed out that a total of more than 100,000 plant magazines are distributed through Consolidated's 11 divisions and "comparatively few are thrown away."

Northrop's three publications are among the brightest in plant journalism.

Tokio Kid, devised for Douglas house organ, urged workers to linger and waste materials.

The company publishes the Northrop *News*, a bi-weekly for plant personnel; Northrop *Life*, a news and picture magazine closely resembling in content and format *Life* magazine, and the *Norcrafter*, which is "more of a general information type of publication similar to many pre-war house organs." The latter two are published quarterly.

The Northrop periodicals are edited by Ken Price, with John Breneman and John Clark as associate editors, under the supervision of Carl Apponyi. All of them are published on slick paper.

Among the features of the bi-weekly *News* is a Rumor Clinic, to which employees are invited to send the choicest rumors and scuttlebutt of the week. The *News* undertakes to present the truth of these grapevine reports, unless they are of a confidential nature. There is also "The Feminine Front" column with information on beauty, clothes and food, in that order.

A recent issue of the *Norcrafter Quarterly* featured a double-truck of sketches on "Snood Moods," cleverly illustrating the uses of that item of feminine war worker apparel. There was also a spread of pictures on the performance of Northrop patrol bombers in Iceland. A late edition of Northrop *Life* featured a picture layout on "We Dish It Out" and "We Take It," showing the work of men on the fighting fronts. There was also a spread of pictures on "Family Day" at Northrop to which employees were invited to bring their families.

Cardinal points in Northrop's editorial policy, Editor Price says are:

No "personalities" or stories telling "what a swell guy so-and-so was before he came to work at the plant;" lots of pictures, "mostly about people who have accomplished things in the plant;" two pages of sports in each issue; plenty of departmental columns, "81 news and sports contributors;" "don't try to sell them on the company's products as much as on the reason for those products;" mention as many names of workers as possible; have plant people do the writing, and "make the publication an activity and not a company service."

"About a year ago we were on the verge of eliminating departmental news columns or rewriting them in shorter, more professional style," Price explained. "But before doing so we decided to distribute a questionnaire and definitely determine the wishes of our readers. Much to our surprise, we found that those questioned wished more departmental news and longer columns."

One of Northrop publications' pet characters is Ichabod Slipshod, whose oafish face, loutish antics and general ineptitude are cartoon features of the three periodicals. Ichabod's sloppy workmanship is a constant wellspring of trouble, and he is another "horrible example" who illustrates how things should not be done.

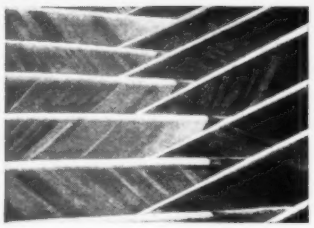
Also in the "colossal" class of aircraft publication systems is the Douglas fleet of seven tabloid weekly newspapers and the monthly *Airview*, the latter with a circulation of 175,000 copies as of January 1, 1944. Editorial policy is determined by a five-man editorial board headed by A. M. Rochlen, director of industrial and public relations.

All are edited by veteran newspaper and magazine men in a highly professional manner, with departmental news contributed by correspondents in the various units and plants.

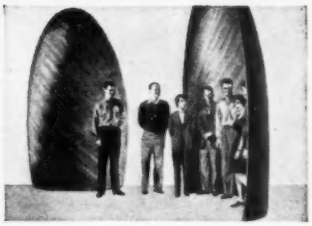
The *Airview* monthly magazine carries 40 pages of feature stories with a four-color front and back cover and occasional inside color pictures. Pictures are taken by staff photographers in Santa Monica, Tulsa, Long Beach, El Segundo, Oklahoma City and Chicago.

A typical recent *Airview* contained a double-page of sketches humorously declaring "It's More Than Hairy Ears" that make an engineer, and an article by a Douglas Havoc bomber pilot telling of his squadron's experiences in the battle of the Bismarck Sea in which a huge Japanese convoy was smashed before it could reach Australia. Another layout illustrated the skip-bombing tactics used by Havoc squadrons. Another article with a picture layout showed the work of

(*Continued on page 124*)



Horizontal and vertical stabilizer skins for the Vultee BT-15 Trainer—made to highest standards by the superior and exclusive Evans molding process.



Molded plywood skin used to streamline fuselage of great cargo glider. These huge sections are molded in one form and have great strength.

Abstract molded plywood design shows how intricate shapes can be molded under extreme heat and pressures. Note the interesting arcs and angles.

BUY MORE WAR BONDS

Molded Plywood . . . A "Fledgling" With a Great Future

The development of molded plywood is destined to match the powerful saga of the timber trails. Evans Products Company through a superior molding process is revolutionizing the use of wood. It is playing a vital role in the war program and will exert a major influence in the use of molded plywood products in peacetime.

Evans molded plywood is formed under great pressure, which is partly responsible for an amazing inherent strength. An ingenious method of applying heat makes possible intricate designs, curvatures and angles. Both factors are most important in determining the utility of molded plywood products.

Evans designers and engineers are constantly at work developing new wood products and new uses for Evans molded plywood. After the war it will be used as structural and design material in products ranging from automobiles to homes. Thus, Evans molded plywood is a "fledgling" with a great future.

★ ★ ★

Vision to Anticipate the Needs of Tomorrow
Creates New Industries Today

C. A. Evans
PRESIDENT

EVANS PRODUCTS COMPANY
DETROIT

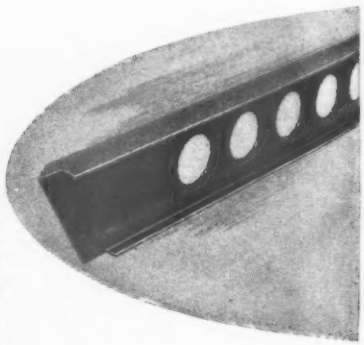
Evans War Products: Machine Gun Mounts • Tank and Automotive Heating and Ventilating Equipment • Evanair Water Heaters • Aircraft Engine Mounts • Airplane Landing Gear Beams • Battery Separators • Prefabricated Houses • Molded Plywood Products • Skyloader • Utility Loader • Auto-Loader • Auto-Railer • Auto-Stop • Stampings • Evanair Domestic Heating Equipment

IN THE C-47

Magnesium floor beams— 25% stronger yet 5% lighter!

The *weight* of a metal is no longer considered a measure of its *strength.* To reduce weight and at the same time retain strength has become a commonplace accomplishment.

Now, through the utilization of Dowmetal Magnesium Alloys, it is possible to combine lighter weight with *increased* strength.



This new "team"—light weight and strength—goes to work in the Dowmetal floor beam installation of the Douglas C-47 "Skytrain," the Air Transport and Troop Carrier Commands' "Workhorse of the Air." Here Dowmetal extruded I-beams have proved 25% stronger yet 5% lighter than the best of all other metals tested—and the cost is 30% less.

Magnesium, the lightest of all structural metals, logically finds its place in industry wherever metal is put in motion, whether by hand or by power: in portable and manual tools, in the reciprocating and moving parts of machinery, in the various fields of transportation. Dowmetal Magnesium Alloys have been developed to fulfill a broad range of requirements: sand, permanent mold and die casting, forging, extrusion, forming, welding, riveting. Dow shops and foundries are equipped to fabricate Dowmetal in quantity, and in small or experimental lots. As the pioneer and major producer of magnesium, Dow offers the knowledge and experience gained during 28 years of research.

DOWMETAL *magnesium*

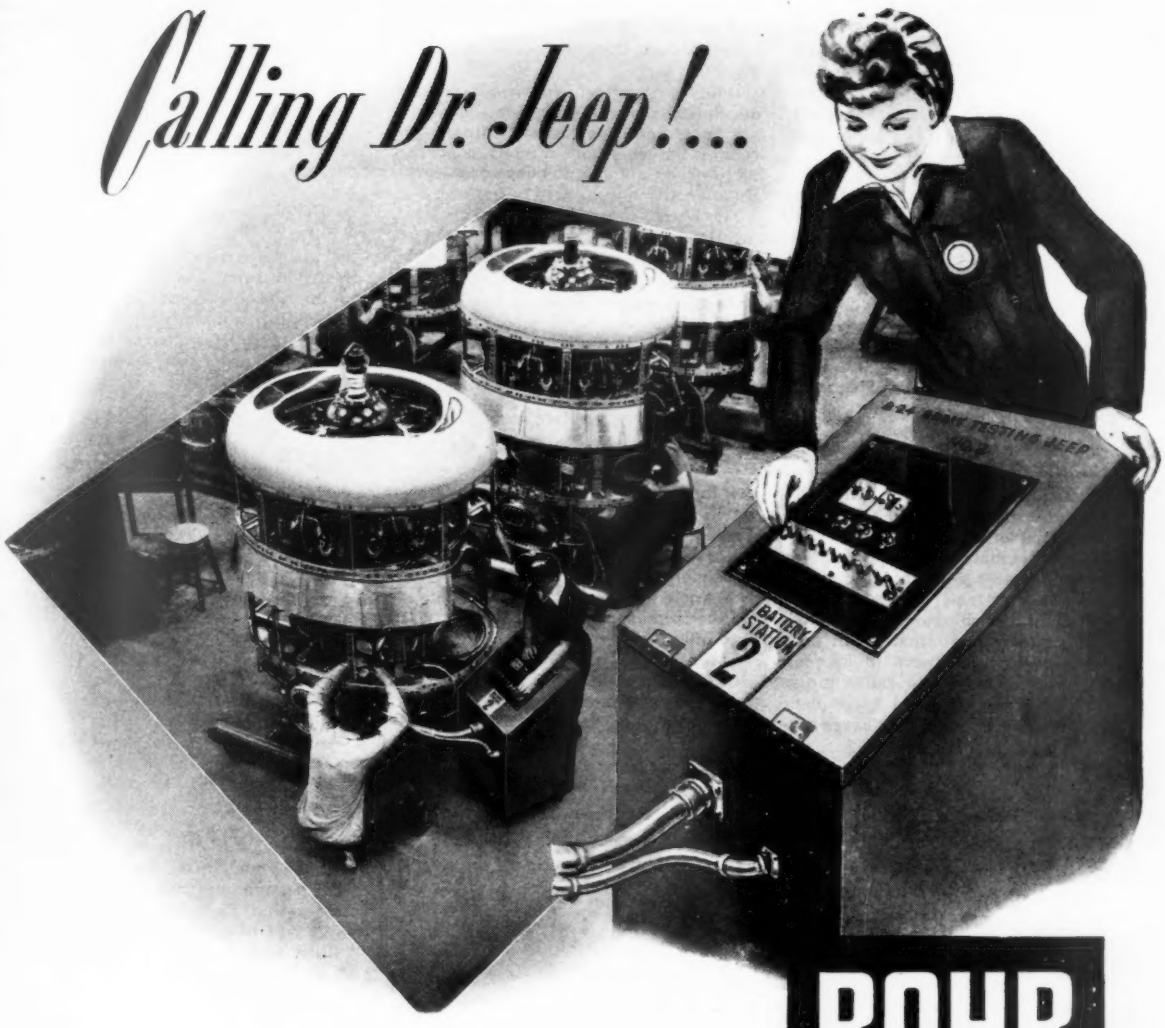
THE METAL OF MOTION

DOWMETAL

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

Calling Dr. Jeep!...



ROHR
AIRCRAFT
CORPORATION

"Dr. Jeep" is one of the busiest fellows on the Rohr Production Line, wheeling up alongside of every motor nacelle and supercharger assembly for a new kind of final inspection. He makes the most thorough and accurate pre-flight check-up yet devised. ★ Rohr engineers developed several "Dr. Jeep" models, each for a specific task, to help Rohr Production Fighters maintain the efficiency of their skills, even while working at top speed. They are used to "okay" Liberator and Constellation motor nacelle assemblies and complicated supercharger installations. ★ These mechanical brains work rapidly, accomplishing with swiftness and certainty tasks formerly requiring thirty individual inspections with a variety of equipment. ★ "Dr. Jeep" is symbolic of developments in war plants throughout America, where engineers labor to give American bomber and fighter crews airplanes of maximum dependability and in great quantity. ★ Today we are "on the job to finish the job." After the war, this same American capacity to solve problems must be given a full opportunity to create the jobs that will win the peace we fight for.

Buy More Bonds . . .

Hold them till maturity.

ROHR AIRCRAFT CORPORATION, CHULA VISTA, CALIF. • HELPING TO WRITE THE STORY OF TOMORROW

(*Continued from page* 120)

Douglas cargo planes, C-47's, C-53's and *Skymasters* in maintaining the Allied supply lines. There was a front cover and inside story and pictures on the Douglas "Cold Room" where research on the performance of parts and engines under sub zero conditions is carried on.

Airview News is published weekly for each of the seven divisions and distributed each Tuesday. Factory-wide announcements and general news are carried simultaneously in each edition, augmented by localized news and features gathered by departmental correspondents.

All the weeklies carry a free classified ad section for employees, as well as a full page of pictures and cartoons. It is published on newsprint in a four-column tabloid format.

Specialized Douglas house magazines are:

Douglas *Service*, covering technical developments, with circulation limited to an Army-approved list of military and commercial operators directly concerned with service and maintenance problems of Douglas airplanes.

The weekly *News Letter*, also of a technical nature, with circulation restricted to company field service men and the manufacturing and maintenance departments.

Rochlen values Douglas house magazines as follows:

"They are one of the most important means of providing personnel with the incentive to maintain and increase production; they keep employees well-informed on all matters that concern them, and they are an effective aid in training and absorbing new employees."

He emphasized that the periodicals "build in the employees a pride in their accomplishments which becomes especially important in an organization which has been tremendously expanded in a short period."

Through these magazines a new form of personalized journalism, unique in industrial history, has invaded the territory of the machine. And aircraft public relations and industrial relations executives believe that plant journalism is here to stay, come peace, come war. END

The B-29

(*Continued from page* 48)

cently returned from England where he served on the staff of the 8th Air Force, is chief of staff of the 20th. Unlike any other U. S. combat air force, the 20th has its headquarters in Washington. Missions for *Superfortress* groups are dispatched from Washington, no matter where the missions eventually will take place. Actually, it is more in keeping with their actual duties to call a group of *Supers* on an operational assignment an aerial "task force"; 20th Air Force officers have been using this term for some time. B-29 task forces originate in the United States and fly directly to their bases in the war theater in which they will operate. Hence, the 20th Air Force is a single global air force, made possible by the tremendous range (still secret) of the *Super*.

Task forces of the 20th have been overseas for some time. Though the *Super* originally was not designed solely to use against the Japs, the majority of the 20th's operations undoubtedly will be against our Asiatic enemy. The first actual combat in which a *Super* was involved took place over Burma during the last week in April this year, when 12 Jap fighters attacked while it was flying cross-country alone and unescorted. The fight lasted 20 minutes and cost the Japs two fighters shot down. The *Super* returned safely with one gunner slightly wounded. Not long after, the Jap radio claimed to have shot down a B-29.

"You and your fancy global maps! Now get us out of this mess!"

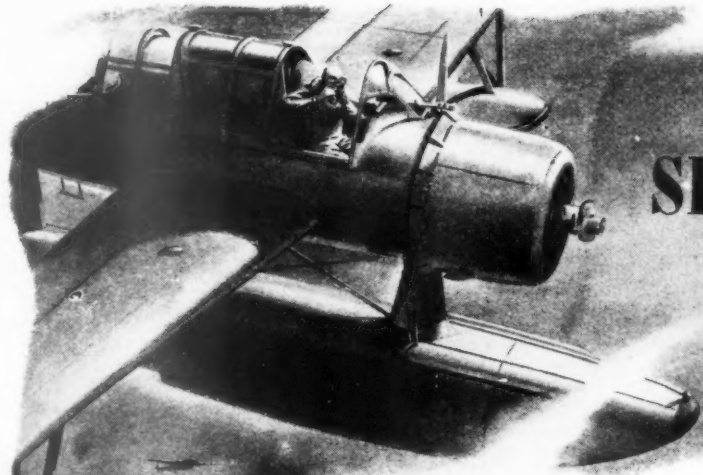
Inasmuch as it is fundamentally a long range, high altitude heavy bomber, it is a foregone conclusion that the Japanese mainland is going to feel the full power of this new bomber, operating from bases deep in China. It is doubted that there will be much need for the B-29 in the European theater; the Boeing *Flying Fortresses* and Consolidated *Liberators* are well able to carry on there.

Just how much of a *Superfortress* the B-29 is can be seen by the fact that it has a gross weight about twice that of the *Flying Fortress*. Wing span of the *Super* is 141.2 feet, length is 98 feet, height, 27 feet. In comparison, the *Flying Fortress* has a wing span of 103 ft. 9 in., length of 74 ft. 9 in. and height of 19 ft. 1 in.

A mid-wing, four-engined, all-metal monoplane with tricycle landing gear, the *Super* carries the greatest load faster, farther and higher than any other airplane in existence. It is powered with four Wright *Cyclone* air-cooled radials, each rated at 2,200 h.p. for take-off and 2,000 h.p. for normal flight. Each of the four-bladed Hamilton Standard propellers has a diameter of 16 ft. 6 in. Each engine is fitted with double turbosuperchargers; no single supercharger available was large enough for the engines.

Except for the bomb bays and part of the fuselage between waist and tail gun positions, the B-29 fuselage is supercharged for high altitude operations. This supercharging operates automatically above 8,000 feet and maintains that pressure to very high altitudes. Early in the *Superfortress* program, exhaustive gunfire damage tests were conducted on pressurized B-29 fuselages. It was found that only the most extensive battle damage at

(*Continued on page* 129)



SPOTTING JAPS IN THE "WILLIWAWS"

ON May 11, 1943, an American Task Force landed on Attu in the Aleutians to drive out the invading Japs. Drive them out they did after prolonged and bitter action in which bullets and arctic weather took heavy toll. This epic action provided one of the early instances of the effective support of ground troops by carrier-based Naval planes.

The heroic men of Attu will not forget the curse of Aleutian climate. Bitter cold. Dense fog. Snow and rain 250 days in the year. A pilot may take off in perfect weather yet 10 minutes later may be unable to land because fog has blanketed his carrier or his landing field.

The Japs used this natural phenomenon to clever advantage. They placed their men and guns right on the fog line. Result—they could see the attackers but the attackers could not see them. And the wily Japs would shift up and down the mountainous coasts, always keeping under cover of the fog. It's pretty hard to kill a foe you can't even see.

The Japs and the fogs weren't the only foes around Attu. Sleet storms, sudden squalls, freezing clouds that load the wings of a bomber with a ton of ice in less than a minute. And the "williwaws" that can drop a plane 3000 feet in a few seconds.

But the Japs had to be routed from U. S. soil in a hurry . . . dead or alive, preferably dead. That called for bombing in weather as treacherous as the foe.

The Navy knew the Kingfisher was the bird to turn the trick . . . to spot targets and guide our bombing planes where they could drop their deadly eggs in the midst of the foe's strongholds. Because they are Edo Float-equipped, Kingfishers (OS2Us) are known as the planes with "sea-going legs"—because they are able to land on rough water and get off again.

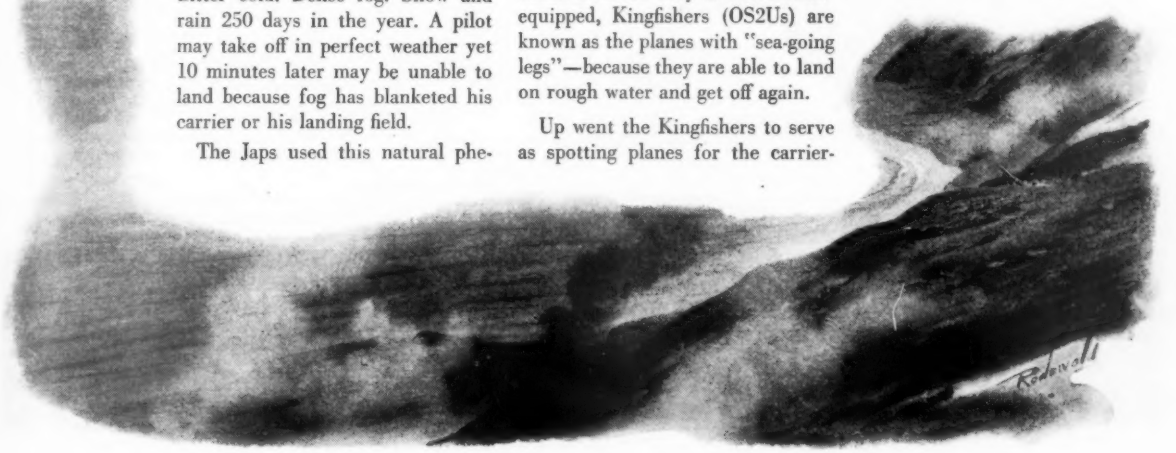
Up went the Kingfishers to serve as spotting planes for the carrier-launched planes assigned to carry out bombing missions. Targets designated by ground units were reported to flights of OS2Us based in the area and relayed through them to the bombing planes. Revetted positions and fox-holes of the enemy came under deadly and accurate strafing and bombing attack. A goodly number of confirmed hits were reported on the designated target areas as well as many "probables".

There aren't any Japs on Attu now. Edo-equipped Kingfishers could climb higher than the Rising Sun. And with the Kuriles only 650 miles away, the gallant crews of the scout planes with the "sea-going legs" can be counted upon to point the way direct to the heart of Japan.

EDO FLOAT GEAR

Serves the United Nations

EDO AIRCRAFT CORPORATION
414 SECOND STREET
COLLEGE POINT, L.I., N.Y.



Highlights from LAISTER-KAUFFMANN ... pilot - engineers

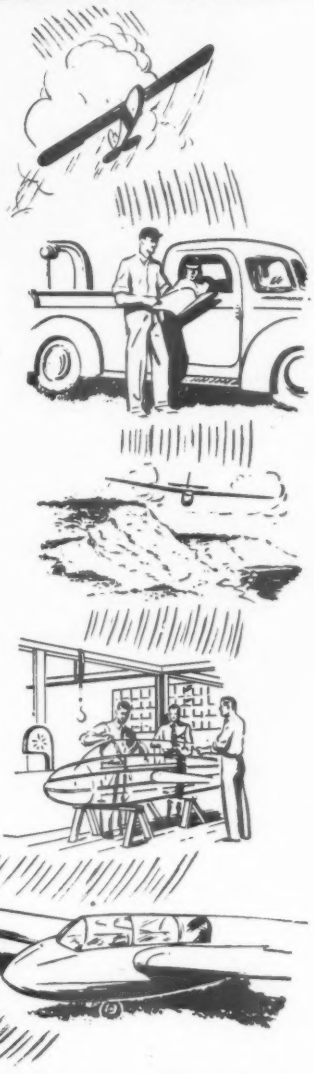
Beginning with Jack Laister, many Laister-Kauffmann engineers are also glider pilots, thoroughly trained in both the practical and scientific aspects of flight. Because of this practical experience, they engineer each ship as though they themselves were going to fly it.

As a matter of fact, Jack Laister, Randy Chapman (Laister-Kauffmann's Chief Engineer) and Innes Bouton and Earl Blount (chiefs of Stress and Design) all look at plans and specifications with practiced eyes that tell them what a glider on blue prints will do in the air.

Randy Chapman got a lot of his glider know-how doing "bread and butter" flying in a sailplane—performing in airshows for several years after he earned his engineering school degree. Those aerobatic exhibitions, the rolls, spins, loops and "upside-down" flying, brought excitement and needed-cash to Randy . . . actually his real interest lay in the science of motorless flight. He entered soaring contests all over the country, often flying the Yankee Doodle, Jack Laister's ship which he had helped Jack build in college.

Buzz Bouton spent several years building and flying gliders as a member of the University of Michigan's glider club. Gradually his interest in flight without power increased until, with the formation of the Laister-Kauffmann Aircraft Corporation, he saw his chance to make the building of gliders his career.

Earl Blount, at work on power planes at the Army's Wright Field, was one of twelve civilian engineers who formed a club devoted to "spare time" glider flying. From that day until he joined Laister-Kauffmann, gliders were the all-important hobby that was to become his profession.



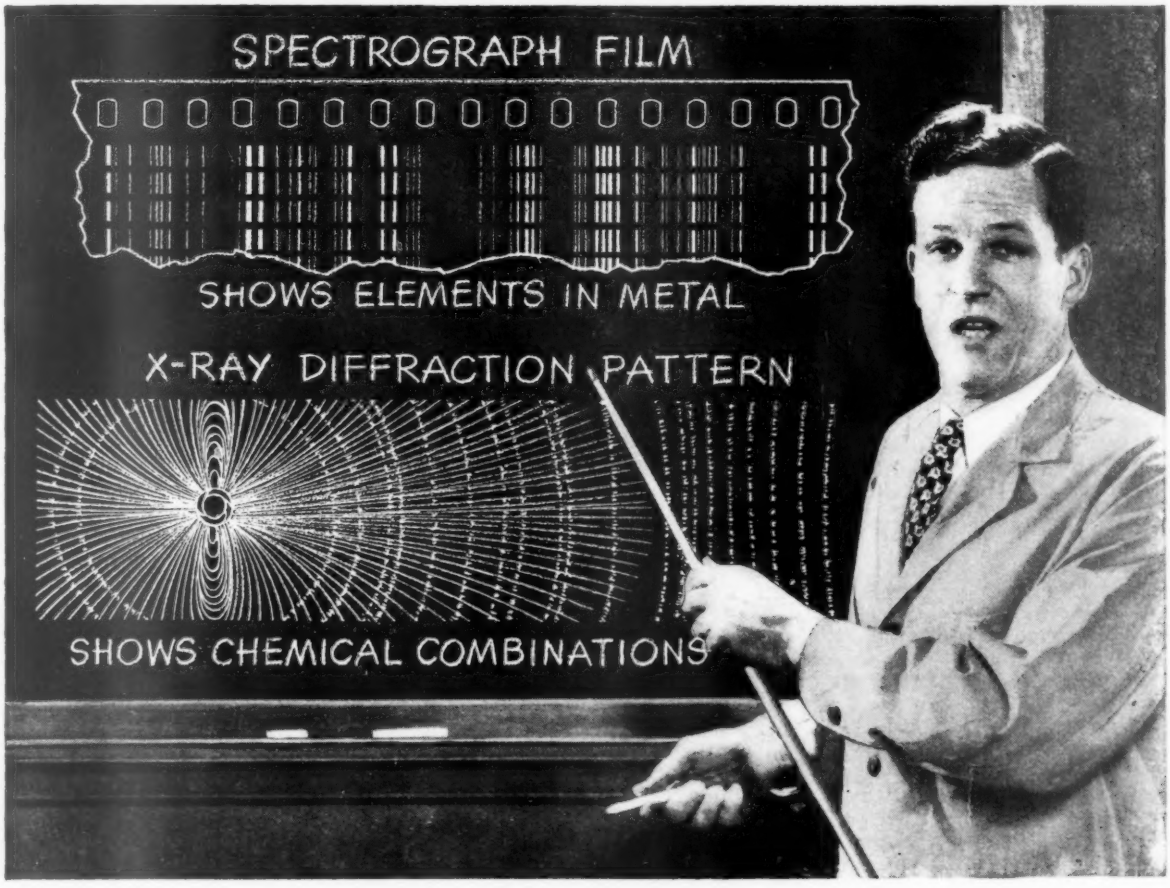
Today, Laister-Kauffmann engineers understand gliders as the ideal creative man always understands his product—from having used it in every conceivable way. They know what it feels like to wager life on engineering and production efficiency, what the structural integrity of a ship can mean to its pilot, and what a man can do with a ship he really believes in.

Your WINGS FOR THE FUTURE are being born today out of Laister-Kauffmann's knowledge and experience.

Wings FOR THE FUTURE

Laister-Kauffmann *Aircraft Corporation*
ST. LOUIS (17) MISSOURI

POINTERS ON ENGINES . . . . . *No. 7 of a Series*



Ranger Gets the "Inside Story"

These patterns tell the inside story of metals.

They are "pictures" taken of the physical and chemical properties of the raw materials which make up parts of the Ranger Sixes and Twelves.

Ranger technicians employ them constantly in their control of quality—assiduously in their daily research into new possibilities.

Under the white arc of the spectrograph, the basic elements in a sample of aluminum are revealed—copper, manganese, silicon—and the proportions in which they occur. The X-ray diffraction camera supplements this information. From the sunburst pattern of its pictures can be determined the *chemical form* in which the elements in a given sample are present.

By using another X-ray technique, Ranger technicians can examine the chemical bond between aluminum fins and the steel cores of Ranger cylinders. In the metallurgical laboratories, technicians have found an efficient engine sealing compound; determined standards for synthetic rubbers used in engine construction; unearthed the "whyfors" of metal fatigue.

All this adds up to knowledge. This knowledge, plus the ingenuity of design and dynamic balance, has created in Ranger engines a sleek, efficient source of aircraft power. The kind of power that lends the "touch of tomorrow in the planes of today."

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PIONEER INSTRUMENTS

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THE INVISIBLE CREW
Precision Equipment by
Bendix Aviation Corporation

(*Continued from page 124*)

extreme altitudes will have any effect on the crew. In the event of cabin pressure failure, however, each member of the crew is completely equipped with an emergency oxygen supply.

The *Super's* pressurized cabin is intended primarily for crew comfort. Though little attention has been given to the fatigue and physical hardship suffered by crew members of high-flying *Fortresses* and *Liberators*, those two factors have contributed more to aircrew deficiencies than anything else. Crew quarters in the *Superfortress* have been designed to overcome those handicaps. Only malfunctioning of the *Super's* cabin pressure system to date has involved the blowing-out of plexiglas waist sighting blisters at high altitude.

The crew consists of from seven to 11 men; pilot, co-pilot, navigator, bombardier, flight engineer, radio operator, and the remainder gunners and relief crewmen. The pilots' cockpit is one of the most comfortable ever designed. Except for flight, manifold pressure and tachometer instruments, all instruments are on the flight engineer's panel. Because of the pressurized fuselage, there is no protruding cockpit as is seen on more conventional aircraft. Much of the nose of the fuselage is transparent, giving the pilots exceptionally good visibility. The bombardier walks forward along an aisle between the pilot and co-pilot seats to his position in the nose. The usual pedestal throttle installation between the pilots' seats has been eliminated, the pilot having the four engines' blue throttle handles beside his left hand, the accepted throttle position since the earliest days of aviation. Meanwhile, lying flat on a low pedestal between the pilots' seats and within easy reach of both is the Minneapolis-Honeywell electronic pilot.

The flight engineer sits at his panel facing the tail, directly behind the co-pilot's seat. The radio operator's position is directly behind the flight engineer, facing the nose. The navigator sits at a desk behind the pilot, facing forward. A large, hollow tube extends from the cockpit compartment back over the bomb bays to the compartment occupied by the gunners toward the rear of the fuselage. At high altitudes, the tube also is pressurized, thus enabling crew members to move through the bomb bay area from one pressurized compartment to the other. The tail gunner's compartment is almost identical with that of the *Flying Fortress*, although larger.

Armament of the *Super* is several .50 caliber machine guns and one 20 mm. cannon.

Probably the most elaborate aircraft radio installation in the world is in the B-29. An example of its range occurred not long ago when a pilot who was ferrying a *Super* overseas found, during his landing approach at Presque Isle, Me., that his landing gear was stuck. He radioed his predicament to the Presque Isle operator. The latter, unable to get technical advice from the men on the field, telephoned Boeing's engineering department at Wichita. He then connected the phone call into the radio circuit in the circling bomber and Boeing engineers told the pilot how to free the jammed gear.

In another similar incident, a Boeing pilot circling over Wichita with stuck landing gear, radioed the ground, the Wichita engineers telephoned Boeing engineers in Seattle for further advice and the pilot got the plane down safely after participating in an hour-long plane-to-Wichita-to-Seattle telephone conversation.

The *Super* is one of the "cleanest" airplanes flying, aerodynamically. The six-wheeled landing gear (three double wheels) is fully retractible. Diameter of the main wheels is 4 ft. 8 in., that of the nose wheels is three feet. When the landing gear is down, the drag of the *Super* is doubled.

Another unusual feature of the B-29 is its wing, technically the Boeing "117". Of web-type construction, this wing first was used on the Boeing *Sea Ranger* (PBB). As installed on the B-29, the wing has 4½° of dihedral and 7° sweepback; aspect ratio is 11.5. A new flap had to be designed to overcome the high wing loading. This giant flap, when extended, increases the total wing area 19 per cent. With this flap, the landing speed of the B-29 is the same as that of the B-17.

Despite the size of the *Super*, the airplane's flight controls are operated man-

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ually. It had been planned originally to use hydraulic boosters, but a system of tabs was developed that eventually gave the *Super* lighter control forces than those on the B-17. The tail surfaces are almost identical in shape to those of the *Fortress.*

Except for the hydraulic braking system, everything that moves on the B-29 is operated either by cables or an electric motor. There are 150 electric motors in the *Super* and it has an auxiliary gasoline engine that runs the electric generators.

The B-29 now is being built at the Boeing factory in Seattle, the Glenn L. Martin plant at Omaha, the Boeing factory at Wichita, the Fisher Body Company at Cleveland and by Bell Aircraft Corporation at Marietta, Ga. The first production models of the *Super* cost approximately $1,000,000 each; the price subsequently has gone down to about $750,000. About 41 per cent of the entire B-29 program is being handled by subcontractors. At the Wichita plant 40 per cent of the workers building B-29's are women.

A brief history of the B-29 is interesting. The idea for such a bomber started in the winter of 1938, progressed through the building of the experimental XB-15 (which still is flying today) and the *Stratoliner* four-engined airliner for TWA and Pan American Airways. In January, 1940, the Army asked for designs for an airplane generally like the B-29, but much lighter. One month later the Army drastically increased its specifications. Boeing then designed what was to be the forerunner of the B-29, the Model 345. Wind tunnel tests totaling 8,000 hours were made at the University of Washington, the California Institute of Technology and the National Advisory Committee for Aeronautics. In August, 1940, construction of three XB-29's was authorized. The first test flight of one of these airplanes was made on September 21, 1941.

Meanwhile, extensive tests were being conducted on various parts of the B-29. Late in 1940, for instance, various B-29 control surfaces, scaled down to the size of the B-17, were flight tested on a B-17C. Later, a scaled-down model of the entire B-29 tail was tested on a B-17E. A scaled-down B-29 tricycle gear was tested at Wright Field on a Douglas *Havoc.*

The entire B-29 program has been carried out with the utmost secrecy. Until recently, few people had ever been close to a *Superfortress,* although they were being built and flown in heavily-populated parts of the country. Large numbers of *Supers* were flown out of the country to distant parts of the world, but the secrets of the B-29 still were kept.

On May 5, 1944, this writer was one of the first civilians to thoroughly inspect a *Superfortress* and to fly in it during an Army acceptance test flight. We were in the air 1 hr. 38 mins. while Lieut. Col. Ralph G. Vaughan, AAF resident representative at Boeing's Wichita plant, put *Super* No. 224451 through her paces. We took off in 20 seconds, at 108 m.p.h.

After a series of flight tests at about 7,000 feet, we started climbing to 20,000 feet. The cabin superchargers automatically turned on at 8,000 feet; the maximum cabin "altitude" we reached was 8,200 feet, while the airplane was at 20,000 feet. During the course of the flight, we flew in nearly every crew position; crew comfort on even the longest flights seems to be exceptionally good.

There was little doubt in the minds of those aviation writers who examined the *Super* in Wichita in May but that this airplane might aptly be named Hara Kiri by the Japs. One thing is sure; this is the airplane that is going to shake Japan to its lowliest pagoda. END

Dilbert, USN

(*Continued from page* 55)•

Comdr.) Robert C. Osborn, USNR, an accomplished fine artist who had done a little cartooning dating back to his days as art editor of the Yale *Record.*

The story of Dilbert, how he came to be and how he has grown through adolescence, is as much a human interest yarn as that of Lieutenant Commander Osborn, who gave him life.

Art became a fascinating subject to Osborn while in high school back in his home town of Oshkosh, Wis. A year at the University of Wisconsin didn't further the art career much, so off to Yale he went and was graduated in 1928. He concluded that European training in art was a necessary ingredient of any successful career. After nearly a year at the British Academy in Rome, followed by eight months in Paris at the Academie Scandinavia, he returned to the United States.

At this point Osborn launched himself on a five-year teaching career at Hotchkiss Prep, not only as a teacher of the history of art, but of Greek philosophy. He was also football coach.

Teaching art to a group of boys between the ages of 14 and 18 is no picnic, Osborn found. He had brought back from Germany what he considered to be some interesting works of art but nobody in his classes was the least bit interested, or much enthused over art in general.

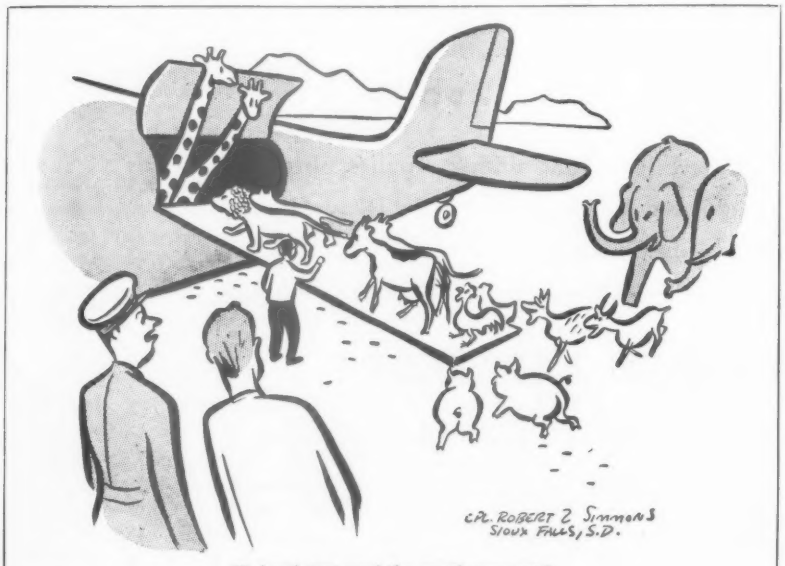
Much experimentation followed in an effort to interest his students. Automobiles and airplanes were the only things Osborn could get his boys to look at. He found that these aroused even greater interest done in color. Smaller items in the aeronautical and automotive fields, such as propellers, attracted artistic attention.

Osborn gave up the teaching profession in favor of more art study at this point, and he returned to Europe for three more years. In France and Portugal he studied all phases of art, such as landscapes, portraits, life studies, etc., because he was convinced he "should be able to paint anything."

Returning once again to this country, Osborn bought a one-acre farm at Salisbury, Conn. He liked to hunt pheasants and fish and this place was located where hunting and fishing were good. When he wasn't painting, landscapes mostly, he was out with his rod and reel or shotgun. To illustrate some pamphlets on hunting and fishing, he was called on by a New York publisher to supply some cartoons.

Osborn started out early on the morning of December 8, 1941, to enlist in the Navy as an apprentice seaman. He had attended CMTC training camp in the summer of 1940, and now he headed straight for the Navy recruiting office in Poughkeepsie, N. Y. Upon arriving there he was informed he should have gone to Hartford, Conn. There were so many new recruits there that Osborn was put off for days.

Meantime he met an old friend, a World



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War I aviator, who urged him to go to Washington, D. C. In the course of several interviews at the Navy Department he found his way to the Aviation Training Division. Training was being accelerated. Plans were being made for a visual education program linked with instruction. One of the ranking officers in the division gave him an assignment to prepare some serious posters on piloting procedures, based on lithographs used by the Royal Air Force. Steps were taken to commission him, which he admits was a surprise.

Osborn had been impressed by the excitement and the sight of officers' desks stacked high with papers needing attention. In returning the finished drawings he included a cartoon of one of the officers to whom he had talked, digging himself out from under official papers on his desk.

Although he thought he would be given some kind of a job in connection with camouflage work, this cartoon helped lead him into his present assignment. Another example of initiative clinched it. On a serious poster illustrating the use of cloud cover as an evasive tactic, he added a touch of wit by having the pilot of the Navy plane thumb his nose at a pursuing Jap as he was about to enter a cloud. This appealed to several of the key officers and the idea of a series of cartoons was developed from it.

In February, 1942, shortly after Osborn was commissioned, he went into a huddle with Captain Doyle and Commander Morehouse to pick a name for the cartoon-character. "Dilbert G. Groundloop" was decided upon originally but this soon became just Dilbert, which was derived from the expression of "pulling a dillie," or making a mistake.

Osborn was sent to the Naval Air Station at Atlanta, Ga., where he was put through the paces of primary flight instruction, the same as a flying cadet. He had never flown a plane before. The ideas for cartoons began coming to him rapidly, because, he frankly states, "I was a first rate Dilbert myself." He made 600 drawings on the primary and intermediate stages of flight instruction, but these were cut down to 265 which were printed and distributed to all aviation shore establishments.

The next series covered errors in the maintenance of planes. As it was decided that Dilbert should never lose his identity as a pilot, another character was chosen for this series of 244 drawings. These centered about a mechanic known as "Spoiler."

Dilbert returned as the main character in the next set of 100 posters on fighting submarines. This group was collected and executed in two weeks at the Naval Air Station, Quonset Point, R. I. A small series of 24 placards deals with swimming.

The newest series shows Dilbert having his trials and tribulations in the Operational Flight Training phase, which is the Naval aviator's final instruction period before combat flying.

The 39-year old Navy artist now is in the South Pacific illustrating Dilbert in actual combat.

Although he has not kept a log book of his flight time, Lieutenant Commander Osborn estimates he has spent at least 400 hours in the air with flying cadets, instructors and skilled aviators in an effort to learn every difficulty a flyer might encounter. By doing this he has been able to make Dilbert an authentic character.

In his latest Operational Flight series he not only spent a good portion of his time in torpedo and dive bombers, but watched signal officers teach field-carrier landings hour after hour, taking notes on good and bad techniques. Three months were spent at the various stations of the Naval Air Operational Training Command in Florida finding out what the young aviators were doing wrong.

Osborn interviewed more than 500 cadets, officers and enlisted men in an effort to learn all the problems. From this information he synthesized the series of pictures, using as much aviation training jargon as possible. About 200 of the cartoons deal with the general phases of operational training and can be used by any type of squadron. The remainder of the series deals with specific types of planes, definite problems and specialized subjects, such as the use of oxygen equipment, gunnery problems and the duties of Air Combat Information officers.

Of the first group of 265 drawings, printed in the late summer of 1942, a run of 3,500 copies was ordered for each, which meant about 900,000 posters. This was a big order for most any printing shop, especially when the posters were in four colors. The entire job was performed on a small press in the processing department of the Navy Building, which was kept running 24 hours a day by enlisted men. Osborn was on the job constantly mixing inks for the proper colors. On one occasion he was called out of bed at 2 a.m. to come down and mix a new batch of ink. The job was so big that the processing department never again tackled any Dilbert printing assignments.

The posters, which were 10 x 13 inches in size, are displayed in glass-covered exhibition boxes placed conspicuously in the hangars and ground school buildings. The "boners" are dealt with in a logical sequence which closely parallel the cadet's flight training. Only posters directly applicable to the student's training are shown. Only one poster is shown at a time in an effort to concentrate his attention on one fault at a time. The posters are changed as frequently as practicable, usually daily or every other day, to hold the cadet's interest and to get him in the habit of looking in the exhibition box.

Pilots do make mistakes. But the Navy is anxious to keep human errors to a minimum. A pilot may get away with a few minor blunders and still live to tell the tale, but these often lead to graver errors. Dilbert's job is to help eliminate these faults by pointing out how ridiculous—and how dangerous—it is to blunder.

It costs the Navy $27,500 to train an aviator. The plane he flies after he has finished his training may be a $90,000 fighter or a $200,000 flying boat. Dilbert is the little man on cardboard who helps the Navy protect its investment in men and airplanes. END

CAP League

TO support and aid the nationwide Civil Air Patrol Cadet program, under which aviation fundamentals are taught to young men and women of pre-draft age, and to obtain civilian backing for aviation development in every community, a new national organization has been formed known as the Civil Air Patrol League, Inc. Membership in the CAP Cadets will be open to young men and women of 15 to 18. The consent of parents is required for enlistment and no pledge of military service is involved. CAP Cadets wear a uniform consisting of regulation garments with special insignia.

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ARMY E NAVY

Awarded to the Detroit and Muskegon Plants of Continental Motors Corporation for High Achievement

Synthetic Air War

(*Continued from page* 32)

score. They asked Kenny to rush a report in detail.

Kenny's report showed he had improved on the skip-bombing technique by adding more forward-firing guns to his *Mitchell* bombers to give them additional fire power against the antiaircraft aboard enemy ships.

As a result, changes were made in some of the medium bombers coming off the assembly lines throughout the nation—more guns were installed in forward positions.

Ultimately, the cycle of improvements continued until a 75-mm. cannon was installed in the nose of the Mitchells so they could duel more effectively with smaller shore batteries and small antiaircraft cannon aboard ships.

When American *Flying Fortresses* first began large-scale daylight bombing operations against Hitler's Europe, they ran into plenty of trouble at the hands of the Luftwaffe. Losses were heavy; there was no precedent for such assaults.

But as bomber crews reported their experiences over Europe, the data was rushed to AAFTAC and appropriate counter measures were worked out.

The task is never-ending. Crafty officers of the German air force are constantly at work figuring out new ways to attack U. S. bombers and their fighter escorts.

When the German air force hits on a new technique and an unusually large number of American bombers are shot down as a result, the wheels begin to turn at the Army Air Forces Tactical Center.

Usually, one or two crews that participated in the assault in which a new technique is used by the enemy are flown to AAFTAC headquarters in Orlando.

Thus a comparatively few hours after the action occurs over Europe, the battle-seasoned crew goes to work with AAFTAC experts to develop a counter-technique.

Ultimately, one or more counter plans are worked out on paper and turned over to the various units of the Demonstration Air Force to try out under simulated war conditions.

Instead of guns and bullets, the crews "shoot" movies which provide a permanent record of what happens.

Once the plans for the new counter technique are turned over to various AAFTAC officers, the bomber and fighter groups and ground crews go into action.

Fortress crews from the four-engined bomber school at Sebring, Fla., are briefed on a bombing mission into "enemy territory" hundreds of miles away.

At designated points they are picked up by their fighter escort which follows them to the target, in exactly the same manner that *Mustangs, Lightnings* and *Thunderbolts* protect U. S. squadrons in assaults on Europe.

Meanwhile, other fighter squadrons play the part of the Luftwaffe. They are told to be on the alert but are not told details of the raid on a specific target.

As the bombers roar toward their targets, they are picked up by detection devices which warn the "enemy" fighter squadrons that bombers are approaching.

In the ensuing mock battle the defending planes use the Luftwaffe's newly revealed technique as nearly as possible and the bombers and their escort try out the counter tactics.

In the projection rooms AAFTAC officers and crews study the results and evaluate the effectiveness of their counter technique. If it meets approval the solution is flashed to the war fronts where it is again checked and rechecked before being tried on the enemy.

All improvements in aircraft and tactics now used in the war fronts are tried at one time or another at AAFTAC. Practically all Air Forces equipment that originates at Wright Field receives its final tests in Florida.

When the Luftwaffe discovered that *Flying Fortresses* were vulnerable when attacked from the front, technicians design a chin turret to supplement the regular machine guns. The chin turrets were tested at AAFTAC and within a few weeks German fighter pilots discovered it was unhealthy to attack from the front.

AAFTAC provided the testing ground for invasion tactics used in Sicily, and engineers provided replicas of Jap pill boxes found at Tarawa. The resulting experiments proved useful when American invasion forces swept ashore in the Marshalls with small casualties.

Scattered about AAFTAC's grounds are a number of cylindrical structures that resemble old-fashioned silos. These buildings are about 40 feet high and house the complicated Link Celestial Navigation trainer.

In the dome of the building is a miniature sky, which includes a wire cupola with winking electric stars that simulate night flying conditions.

Below the dome is suspended a scale model of the operating section of a bomber which is on a pivot that permits it to simulate banking, turning, diving and climbing maneuvers on the same principal as the standard Link trainer.

The pilot, navigator, radioman and bombardier enter the mock-up fuselage by climbing a narrow, winding staircase. On the floor below them is a screen on which is thrown a photograph of actual terrain.

Also on the floor of the structure is a training officer's control room with complicated electrical equipment and control boards to direct the "flight," simulate flying conditions and keep track of the course steered by the bomber crew.

Once the various crew members take their assigned posts in the fuselage and adjust their headphones, the room is plunged into darkness and the instructor tells the crew what their mission will be.

If it is over the Ruhr valley, an actual aerial photograph of the valley is thrown on the screen below the fuselage.

The pilot moves knobs, switches and other gadgets, and the machine begins to pitch and sway as in an actual take-off. Slowly the altimeter registers the climb.

When the altimeter hits 10,000 and above, stars begin to twinkle in the synthetic sky. Under the guiding hand of the

(*Continued on page* 138)

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*Pronounced — Hoo-dye

● Shown on North American Mitchell B25 Bomber above, the Hydraulic Shimmy Damper is only one of the products which Houdaille-Hershey is producing in quantity for the aviation industry

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(*Continued from page* 134)

instructor, the stars move and fade as in actual flight. The navigator is kept busy "shooting" the stars to get the plane's position.

After a specified period of flight, the crew can see the picture of the Ruhr valley below as it would appear to them at a certain bombing altitude. Countless such pictures of enemy terrain are available for altitudes ranging from low level to more than 30,000 feet.

As the plane flies toward and over the target area, its flight course is traced by an electrical device on a chart watched by the instructor. He can simulate cross winds, clouds and mist to make the "mission" more difficult.

When the navigator spots a recognition point, such as an important building, river or railway yards, he directs the pilot toward the objective by following a map of the enemy area.

Then the bombardier goes into action. He sees the target far below as it would appear to him at bombing height on an actual mission. At the right time he presses the bomb release and a short time later a light flashes on the screen below to designate a hit.

The crew then flies back to its home field, lands, and piles out of the "bomber." The instructor then points out the errors and good points of the mission. Not a man is lost and no gasoline is consumed, yet the crew gets valuable training.

Another example of training is the "air-sea rescue mission."

Two Coast Guard crash boats take a five-man rubber life raft and a bomber crew 15 or 20 miles out in the Atlantic. The crew is left aboard the raft, with regular flight rations and equipment, to shift for itself.

Meanwhile, back at AAFTAC a search is organized for the crew of the bomber which has been reported "missing." Three *Liberators* work out a search system and take off to locate the raft. Its exact location is not disclosed.

When the bombers locate the rubber raft, one circles over the survivors and the other two fly toward the coast to establish the correct location. The position of the raft then is radioed to a crash boat which sets out to pick up the crew.

During the search, the men on the raft eat K-rations and use the various devices they would have in case of a landing at sea. These include flares, mirrors, the "Gibson girl" short wave radio transmitter, colored water slicks, etc.

Another innovation at AAFTAC is a jungle garden in which crews will learn methods of survival. The garden is being stocked with poisonous and non-poisonous snakes and poisonous and edible plants.

Many a pilot and crew member who experiences a brush with death on some foreign fighting front has reason to remember his AAFTAC training. END

Pity the Poor Instructor!

(*Continued from page* 34)

hardened instructor. Whatever his experience, whatever his abilities, his nature, his mental equipment, he will finally honestly agree that flyers are not a race apart. They are by no means unique. Neither do they possess any particular attributes to make them more suitable pilot material than the average normal human being.

I suspect that some will disagree with me; that I will be considered heretical. I may be condemned as foolish, and perhaps even "flight happy." But the conviction will be defended until my last drop of gas, and in marshalling my evidence and bringing hope to those aspirants who fear flying requires something of the metaphysical, not to say seraphic, I recall some of the cadets with whom it has been my lot to spend hours aloft.

"This tab," I informed a group of Army cadets one day, pointing to a control handle inside the cockpit, "regulates the elevator pressure on the stick, so that it is possible to trim ship easily through simply moving this tab forward or back in flight. It controls the tendency to dive or climb, and is operated from either cockpit."

They considered this for a moment in silence. Finally Cadet Fuff suggested thoughtfully, "But sir, it seems to me that it would be necessary to set the tab while flying the ship across wind."

"Why?" I demanded, intrigued by this new idea.

"Because of the bumps in windy air," Fuff replied, evidently visualizing the air as a sort of river surface rather than an encompassing element. "Going up or down wind, you are bound to run into bumps and thus be always changing your tab setting! And cross-wind you would not hit any bumps!"

Ingenious is the word for it.

"Consider for a moment," I said, "that you are in a rowboat out of sight of land, in the Mississippi River delta, in pitch black darkness. How would you know which direction is cross-river, or up-river? Or down-stream?" I was planning next to compare the airplane in a moving body of air with fish in a moving stream.

"Oh, that'd be easy," Fuff declared. "It's lots harder to row upstream!"

If he had only stopped to realize that an airplane is in a *moving element*, regardless of which direction it is flying, he would have seen instantly that level flight is as easy going north or south as east, and the wind has nothing to do with it any more than a river current out of sight of land makes rowing seem any more difficult in one direction than in any other. Does a fish in the Gulf Stream find it more trouble to swim there than

"How many of you guys like duck?"

FLYING

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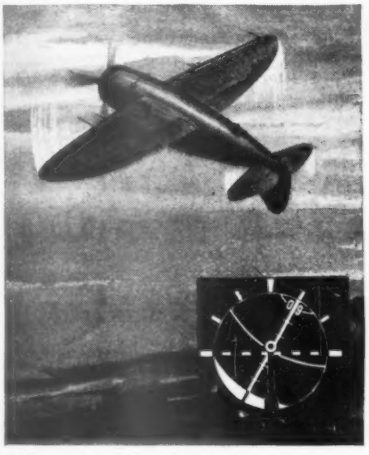

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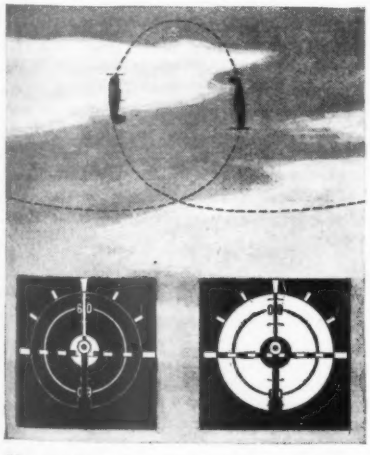

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in the Sargasso Sea?

I am not sure that he sees it yet. Many adults don't.

Then there was Naval flying cadet Pinkpunk who did not have the word. He provided all hands with the smile of superiority when, after a particularly bad series of landings, he explained away his invariable dive into the sod, wheels first, with the naive statement that he believed he must have been "leveling off too high." Of course, exactly the contrary was the case; he had failed to level off from his glide.

Some cadets, learning of the existence of "torque," which is the gyroscopic effect of propeller rotation upon the plane, attempt to correct for it with their controls before it makes itself apparent during the take-off, thus completely ignoring the fact that all airplanes are slightly dissimilar in their operating characteristics due to rigging, power output and a number of factors. What is correct for one airplane might be too much or too little control for another. And the proper moment to compensate with rudder for any turning moment at the time of take-off is when it begins to show up—not according to some mathematical formula out of a book. These technically-minded, or "mechanical" students merely succeed in making flying difficult, and the ensuing gyrations of the airplane are both excessive and alarming. And entirely unnecessary.

Three years ago Student Snafu in an advanced course took me for a cross-country trip of about three hours' duration to qualify in the extended flight portion of the curriculum. He had carefully plotted his course on the map and needed but to follow his compass to the northern end of a rather large valley in Southern California where we were to land and immediately begin the return trip of little more than an hour.

With Snafu at the controls we took off into clear air under a sunny sky and flew along the bold mountains flanking our flight to the eastward.

Within the specified time we reached our destination but the plane flew merrily on. I noticed that Student Snafu was glancing around for the airport—which we had just flown directly over—located in the only narrow valley between towering mountains in that area. On and on we went, down the widening valley (involving a change of compass course), past Palm Springs, and rapidly nearing the great inland ocean known as the Salton Sea. Under us was an arid desert. Ahead of us stretched the blue waters far into the distance. Snafu still made no effort to correct his error.

At length I took over control when we were in danger of expending half our gasoline supply and turned the plane around for home. Of course the student failed his cross-country hop. Why had he not turned back upon seeing the big Salton Sea, after consulting his map? I will never know. When I took charge he was 30 minutes beyond his destination. He had no explanation save that he missed seeing the airport.

There are those students who hear but heed not. Before leaving the airport I informed Cadet Gizmo to take me via the usual route to an auxiliary field about five miles to the east, flying over at 1,000 feet altitude, and then circle the field and land. Off we went. One thousand feet, 2,000 feet—and headed north instead of east. This was becoming interesting. What would Gizmo do next? My patience was rewarded, for when I assumed command of the plane we were some 30 miles north of our home airdrome and about 7,000 feet up. And still going, directly for the gleaming silver dome of an observatory on Mt. Wilson which was so far out of bounds that it was visible only on clearest days.

The longer an instructor lives and works with flight students, the more unpredictable he finds them.

Part of this situation could have been avoided in the old days when less competent tests given to prospective flight students by selection boards failed to reveal the glaring deficiencies. Happily, steps now are being taken to improve selection by a better undersanding of aptitude.

No, obviously flyers are not a race apart but are a growing group of rather normal persons striving to adapt themselves to an unnatural environment. But they are individualists, just the same, and their odd characteristics stand out a bit more boldly against their chosen careers than do those of earthbound mortals. Flight students include brainy graduate aeronautical engineers as well as dreamy-eyed theorists. But at times instructors wish they would exhibit less of the embryonic prima donna and more of the common, rational, reasoning human being.

Perhaps it is partially the environment. They are a grand cross-section of our nation. From college halls, farms, shops and professions they come suddenly into a confusing area buzzing with military aircraft. They are staring history right in the face. More, they will make history. END

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15 YEARS AGO

FROM the August, 1929, issue of this magazine:

The magazine was campaigning for a National Air Academy to take its place beside Annapolis and West Point . . . Roger Babson predicted that aviation would transform the commercial transportation of passengers. He also predicted that aviation industries would have to pass through a reorganization stage before their securities as a group reached "an assured basis" . . . The magazine reported the landing of the Bernard monoplane *Yellow Bird* with Rene Lefevre, Armeno Lotti and the stowaway Jean Assolant, at Santander, Spain, approximately 30 hours after taking off from Old Orchard, Me. . .

Grover Loening, described as "most prominent not only in aeronautical circles but in New York social circles as well," was flying his own airplanes, a De Havilland *Moth* and a Curtiss *Robin*. He had recently been forced down in a Virginia cow pasture and just barely made a nearby fence ahead of some long-horned Jersey cattle . . . A Packard-built Diesel engine was installed in a six-passenger Stinson *Detroiter* airplane . . . Three of the latest aircraft were the Kreutzer trimotor *Air Coach* with a 95-h.p. and two 65-h.p. Le Blond radial engines; the Great Lakes Model 2T-1 trainer and sports plane with a 95-h.p. engine, and the Gates Aircraft Corp.'s Belgian R.S.V. trainer . . . END

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On April 17, 1944, TWA's new Lockheed *Constellation* hung up the record of 6 hours 58 minutes for non-stop flight, Burbank, Calif., to Washington, D. C. Average speed: 330.17 M.P.H.

Constellations, developed for Transcontinental and Western Air Lines by Lockheed Aircraft Corporation, are going direct to the Army Air Forces Materiel Command for the duration. But when the war is won, they will carry 57 passengers coast-to-coast on regular nine-hour flights, or fly to London and Paris overnight.

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TWA inaugurated Link training March, 1938. Links are now in operation in Kansas City, Chicago, New York, Burbank and Washington. Captains take Link refresher courses every month; co-pilots receive 20 hours of Link time in *basic,* 20 hours in *advanced* courses. TWA has given Link training to 900 commercial transport pilots, to 500 other pilots under the War Training Service Program of the C.A.A.

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TWA LINK INSTRUCTOR, AL MUTCHLER, *checks a "let-down" chart with a student of instrument flying. Formerly Link Instructor for the R.A.F., Mutchler trained many of the Ferry Command pilots who made the first vital deliveries of bombers overseas.*

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Report from Washington

(*Continued from page 45*)

ministration. Indications are that CAA and PHS will pick up the air quarantine problem where Army and Navy drops it at war's end. PHS will probably lay down the rules, CAA enforce them. . . . If this turns out to be the set-up, it will mean that CAA medics will expand their activities and branch offices throughout the world. . . .

Lee-ason

With the recent arrival in Washington of John C. Lee as acting manager of the Aeronautical Chamber of Commerce for three months, things have begun to hum at the Chamber's 15th Street headquarters. No bang-on-the-desk efficiency expert, Lee has moved in with quiet efficiency, no committments and a friendly grin. He has already proved his abilities as an organizer by his management of the West Coast Aircraft War Production Council. He announces as his objective:

"To make ACC a two-way liaison—from the industry to the proper leadership here in Washington, and from Washington leadership to the industry." Mr. Lee plans no personnel changes. . . . If his stay here wins him nothing else, it should deserve a medal for courage—he has picked the three hottest months in what Washingtonians, at least, consider the hottest summer town in the world. . . .

Gremliar

Our informant swears that the following story is true, but since it is obviously impossible to document it now, we prefer at this time to nominate him to the Loyal Order of Gremliars, pending verification after the war. . . . The scene is a German air base in Norway, above which a four-engined patrol bomber is circling, obviously in trouble, without radio. At last it drops under the low ceiling over the field and makes a fast landing. But instead of taxiing to the hangars, the pilot guns the engines and sends the plane skidding to a stop at the far end of a runway, where the crew leaps out, sets fire to the plane, and scurries out of sight behind rocks beyond the edge of the field. Ground crews, rushing to the scene, identify the plane as a Luftwaffe model, but its crew opens fire from the boulders. Not until the groundmen have yelled themselves hoarse do they convince the airmen that they are among friends. They thought they were landing on an American field in Iceland! . . .

Sweetest Airport

Trouble with recruiting members for the Loyal Order of Gremliars is that no matter how tall a tale you hear, somebody else comes along with a yarn to top it—but true. We make a low bow in this connection to F. M. Blunk of the Australian News and Information Bureau. . . . Seems that two years ago, during the Jap push toward Australia, Allied airports were thrown together along the northern coast of that continent in a matter of hours. Runways were ripped from the jungle and to hell with proper surfacing. Such an "airdrome" was built in 14 days at Mareeba on the Atherton Tableland, where landing strips were topped with white granite just in time to receive the big stuff for the battle north of the mainland, beginning May 7, 1942. But with the big stuff came an almost insurmountable hazard. Pilots found the field overhung with a white granite dust cloud. Visibility was zero-zero. Water dried so quickly that it was practically useless. . . . And then — overnight — the cloud disappeared. The answer: an improvising Aussie went to a sugar factory next to the field, bought its entire stock of molasses, mixed the molasses with water, and sprayed it on the runways. The mixture dried almost immediately under the tropic sun, banishing the dust cloud and creating what pilots promptly and accurately dubbed the sweetest airport on the battlefront. . . .

Co-Deputies

The decision to have two deputy administrators at the Civil Aeronautics Administration is another bright signpost pointing toward the global scope of postwar American aviation. Col. Alfred S. Koch, now returned from the wars, will be co-deputy administrator specializing in world aviation problems now being concentrated at CAA. John E. Sommers, who gave up his New York CAA post as manager of Region I when Koch joined the Army, will be the co-deputy in charge of domestic activities. . . . Koch's field already includes tentative plans for world-wide inspection services, aviation quarantine activities, world co-ordination of airways, and a world-wide aviation educational program. . . . With Koch's return, top CAA offices have been reshuffled and the Administrator now has a corner suite in the Department of Commerce building, flanked by offices for the deputies and by a large conference room to expedite meetings among CAA officials and industry representatives. END

Air Corps or Air Force?

IN peacetime, the Air Corps was the generic name of the military aeronautic organization. Officers of the Air Corps were entitled to special dispensation by legislation and therefore any officer in the Air Forces today signs "A.C." after his name to indicate that he is entitled to these legislative benefits.

Before the war, the Air Corps was the administrative center of Army aeronautical activity and there was a group of air forces associated with it, loosely coordinated by the corps but corresponding more closely to the "air arms" of the fleet than to the present unit. When war started, the tactical organization became all-important, grew enormously, and finally assimilated the Air Corps. The name for all Army flying forces is now Air Forces.

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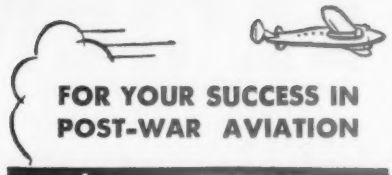

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CLEAN VISION SUNGLASSES

(*Continued from page 76*)

addition to those in which fighters escorted bombers and transports. Several hundred fighters also maintained a constant patrol over surface forces crossing the Channel to France.

TRANSPORTS. The great majority of planes of this type were the famed, veteran Douglas *Skytrain* (C-47), military counterpart of the standard airliner used by nearly all U. S. airlines. Some Curtiss *Commandos* also were reported in these operations. It was possible that a number of the newer, four-engined Douglas *Skymasters* (C-54A) had taken part, but this was not announced officially.

The initial wave of transports on the D-Day operation was nine planes wide and 230 miles long. Many of the transports carried British and American paratroopers, many towed gliders carrying Allied airborne troops, guns, jeeps and other essential ground equipment. Some of the planes dropped airborne engineers; many of the transports also dropped "parapacks," containing food, ammunition and medical supplies. Each *Skytrain* carried 24 fully-equipped soldiers. Each glider carried nearly as many men; some of the larger gliders carried even more.

Nearly all of the gigantic formation of transports crossed the Channel "on the deck" (within a few feet of the water). It took two hours for them to release all their gliders and paratroops; average unloading time for paratroops was 12 seconds per plane. Within four days several Allied air strips had been established, upon which the transports then began landing reinforcements and supplies and picking up wounded and German prisoners for return to England.

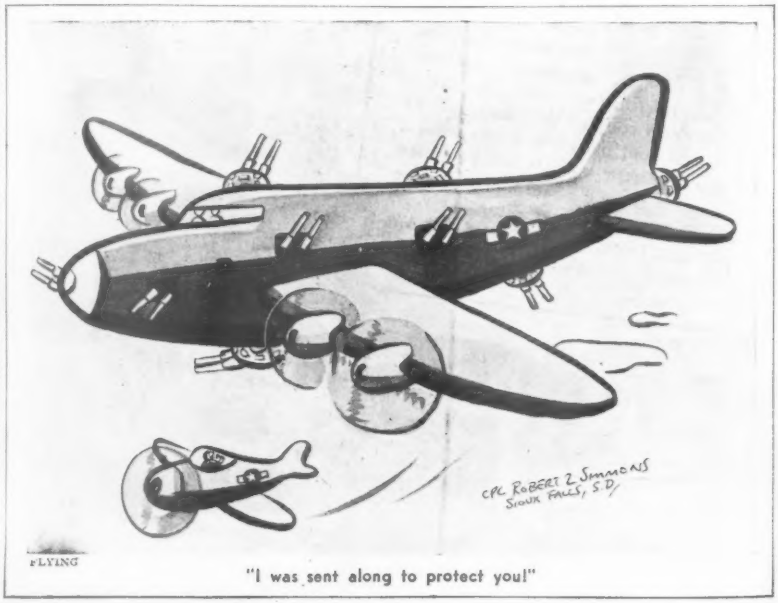
An interesting fact was that the transports were painted with large black and white bands around the fuselage and special colored lights were installed for night flying. It is believed this was done so as to avoid another tragic accident like that during the Sicilian campaign in which a number of Allied transports were shot down by Allied gunners. Within a few hours after the invasion transports appeared over France with their unusual paint jobs, Allied fighter pilots reported shooting down German planes carrying similar markings and trying to sneak their own reinforcements through.

Shortly after the initial D-Day operations, U. S. officials announced that only about 24 Troop Carrier Command transports were lost in the operation. More than 1,000 planes participated, carrying about 24,000 men—the equivalent of two airborne divisions. The D-Day armada numbered more than three times the 350 planes operated by all the U. S. airlines before the war.

GLIDERS. The majority used were the American Waco CG-4A and the British Airspeed *Horsa*. Both are built of wood and fabric and have a design tow-speed of about 150 m.p.h. Many hundreds of gliders were used in the opening operations, carrying airborne troops, jeeps, anti-tank guns, field guns and other heavy equipment and supplies. During the night of June 6-7, gliders were towed off from one British air field at a rate of one every 15 seconds. Some gliders were towed across by bombers, notably the huge tank-carrying British *Hamilcar*, its wing spread greater than the *Lancaster*. *Hamilcars* were flown in to support hard-pressed airborne troops. One of the first light tanks to be landed by one of these gliders silenced within two minutes a German gunpost which had been causing heavy casualties among the ground troops. Another tank landed by a *Hamilcar* immediately blew off the top of a tower on which German snipers were concealed.

The gliders cut loose from their tow planes at about 500 feet over their landing area. Many were wrecked or damaged on landing; the Germans had set up poles and other obstacles in anticipation of airplane and glider landings. One report said some gliders used parachutes as

(*Continued on page 150*)



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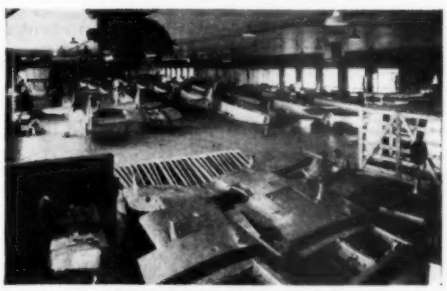

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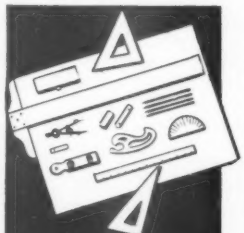

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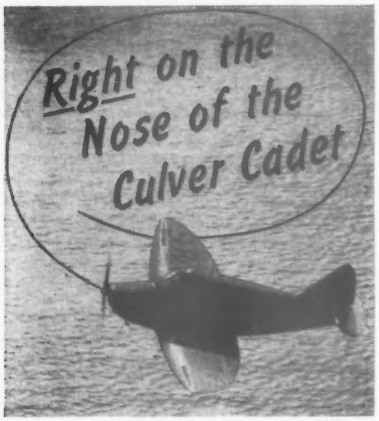

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(*Continued from page* 146)

brakes, opening them just as they touched. One observer flying over the Cherbourg peninsula reported seeing a 500-acre section "packed with gliders." Gliders usually are considered to be expendable. But those that did not crash during their landings in France can be dismantled and moved to an Allied landing strip. They can then be towed back to England, carrying wounded if necessary.

PARATROOPS. Both British and American paratroops have been participating in the invasion. A German report said that the American 82nd and 101st Parachute Divisions were among those that landed during D-Day operations. Vari-colored parachutes were used, each color serving as the code for some type of equipment or supplies. Colors reported were red, blue, purple, orange and yellow; the paratroops themselves used white parachutes. The Germans, meanwhile, complained that some of the dropped parachutes carried sacks of straw that exploded when touched.

* * *

Aerial photographic reconnaissance planes have played a vital role in the invasion. American *Lightnings* and British *Mosquitoes* and *Spitfires* photographed the entire 3,000 mile invasion coastline prior to D-Day. Nearly 500,000 pictures were taken in that area by the British planes alone. Most flying of this nature is done at high altitudes; much of the invasion coast was photographed from 37,000 feet.

Photo reconnaissance planes must fly unarmed because of the weight of their many cameras. The *Lightning* carries four cameras, the *Mosquito* up to five and the *Spitfire* two.

Since D-Day these planes have been flying over the battle areas recording all phases of the operations. One group of *Lightning* pilots photographed the invasion operations and the area in which they were taking place. This group covered the entire coastline to a depth of 25 miles inland, taking a total of 1,440 pictures.

As this issue goes to press, it has been announced that the Allies have completed and are operating several air strips in France. Transports are operating between England and these strips and fighters and bombers are landing on them to refuel and rearm. Elsewhere in France, the Ninth Air Force and the First RAF Group have set up headquarters. Allied air supremacy is so overwhelming that Piper *Cubs* already are based in France, flying liaison missions.

Within a week after the invasion started, Civil Affairs (G-5) units of the Allied expeditionary forces were with the troops to organize civilian life, mobilize resources and keep the highways clear for advancing ground troops. They came, as might have been expected in this air-supported attack—by gliders. END

Air Mail Comes of Age

(*Continued from page* 25)

we forget that we have a highly efficient motor transport and rail service to share in the work.

Motor transport will be resumed after the war, undoubtedly with increased emphasis. It is well adapted to short-haul traffic. It is popular with the public. At least for the present, the work it is doing will continue. Historically as well as practically, these are sound conclusions and consistent with Federal policy down through the years. Indeed, the same Post Office executive who pioneered carrying mail by automobile—Otto Praeger—was the leading spirit in pioneering air mail for the department.

There seems little need for promotional or other subsidies on the heavily-loaded, much used air mail routes between our larger population and trade centers. The same would seem to apply to air parcel post. Most ambitious of these, and perhaps most familiar, is the proposal to carry all possible first-class mail by air. The necessary subsidy, it is argued, would be more than repaid in speeding commerce and the nation's correspondence generally. It seems to me that it is sound to carry all first-class mail by air whenever its ultimate delivery will be advanced thereby, with other forms of transport used whenever they may accomplish the same result at less cost.

Moves toward rate reductions and subsidies to increase volume are, again speaking generally, extremely unwise. Volume increase cannot go on forever; it shows signs now of reaching a plateau and leveling off. It can be stimulated by air transport service as it will be constituted as soon as the war is over—a service more efficient and well-equipped than ever before in its history. Advances toward the saturation point will be inevitable on the old-fashioned basis of a merchant giving the public what it wants when it wants it. Rates can be readjusted as this progress shows on the balance sheets. Air parcel post can have a parallel development. It is sound optimism to anticipate that charges will be reduced at a fairly rapid rate and it hardly seems necessary to try to force it by the subsidy method.

So much for the domestic situation. Looking abroad, the elements of the problem are entirely different. We have very little pre-war records of reference. What foreign air mail American planes carried was on a highly subsidized basis. Foreign lines flying our flag were in a pioneer era up to the day we entered the war and, although only for a short time, will probably have to be considered in that category until we get our post-war bearings.

As was true in the 1920's in the domestic field, soundly planned subsidies would seem to be in order. They should differ in one marked degree—their duration. With the know-how gained from our war transport operations, all but a few of them, so far as air mail is concerned, should be unnecessary after a reasonable period of experimenting. This is said on the premise that lines operated for diplomatic or world political reasons will be subsidized by some other department.

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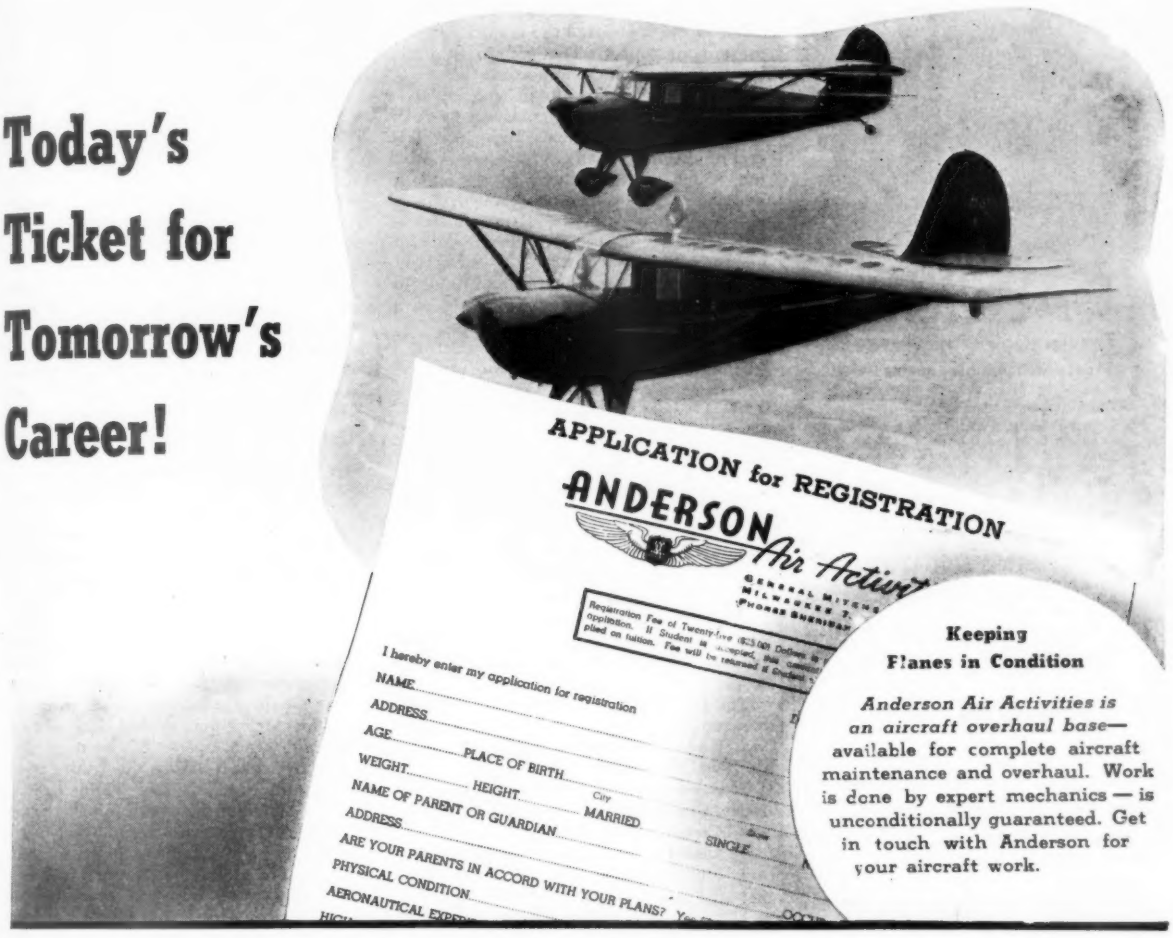
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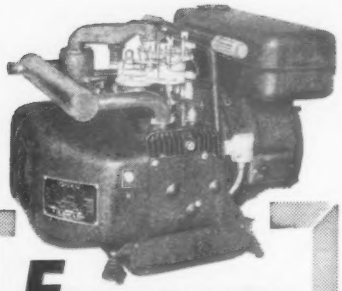

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To sum up, the Federal Government chartered and sponsored the majority of the present air routes. This sponsorship has been one of the most important factors, if not the most important, in the development of our present air transport system. Throughout the development period, Federal financial aid was a most essential factor. Such aid was given wisely and in keeping with a sound program of development and progress, and the air transport industry has reciprocated by doing a magnificent job.

The Government should continue to give all proper encouragement and wise assistance to aviation development. At the same time, we must be mindful of a like obligation to other forms of transportation, also vital to the safety and well-being of the nation. By utilizing the peculiar advantages of each, impartially, a completely effective and reliable service will be maintained and a material contribution made to the stability of the entire transportation system.

In bringing this about, I favor a policy of having as few subsidies as possible, at home or abroad. Air mail has not only come of age; it has proved that it can earn its own way. It should not be placed in an embarrassing position by unnecessary financial aids.

Air transport as a whole, I believe, has reached a point where it will best serve the interests of the nation by engaging in competition with other great transportation services on an equal, financially healthful basis. END

Aerial Eavesdropper

(*Continued from page 68*)

altitude constant, "etc. and then later, "Did you follow that?"

Student—"Yes, I think I got it all right."

On a bomber, the wire recorder is plugged into the inter-communication system and records all sounds made inside the plane during a mission, a feat which no other device operates rapidly enough to perform.

The first reported experiment with the recorder in a bomber in actual combat was made in a mission over Le Bourget Airfield, near Paris.

The recorder was placed in the observer's compartment and plugged into the intercom. Maj. Howard L. Nussbaum, a former radio network executive and now radio public relations officer, went along to describe and record the flight.

The playback detailed every aspect of the mission. Nussbaum's voice describing the flight was interrupted by that of a crew member singing out, for instance, "Flak 4:30 high," or "I can see the Eiffel Tower." "Where?" "Just below."

A complete record of enemy fighter tactics was available to the air command because of the amazing sensitivity of the magnetic wire recorder.

In conjunction with aerial photography, the instrument affords an unmatchable means for studying enemy tactics. But what of its post-war, peacetime future?

To suggest a few of its limitless uses: It may be placed in the pilots' compartments of commercial airliners to furnish a complete record of activities during adverse weather conditions and, more important, during unexpected accidents and possibly crack-ups. Authorities then would be able to study the causes of accidents more thoroughly and to take proper remedial measures for the future.

Second, it might be used in test flights, so that the test pilot could make a complete record of his observations and, as in the commercial liners, of accidents and their causes. Third, the device has innumerable potential uses in every day business life, as a dictaphone in offices, for example. It might even be used in the home to record from the radio.

In aviation, however, the magnetic wire recorder may be responsible in considerable measure for vastly increased safety in commercial operations. END

Classroom Navigation

(*Continued from page 51*)

Another device is the enlarged model of the aperiodic compass, used to teach students to take compass readings as easily as they read a clock. It also is used to show the cadets how to correct for any compass deviation.

Instruments are designed to operate accurately under laboratory, or standard, conditions. Bombing tables also are set up for standard conditions. Bombardiers use the C-2 computer to correct indicated altitude for true bombing altitude and there is a Felsenthal-built over-sized training aid to show students how to use this computer.

A pressure correction demonstrator shows graphically the effect of various pressures on the calibrated altimeter reading.

Still another device aids the students to understand the mysteries of time and date, including the change which takes place when the international date line is crossed. The instructor makes use of a large world model, complete with movable night and day—night being represented by a darkened arc. Noon is marked in the center of the light disc which represents daylight, and midnight is marked in the center of the shaded portion. As the light and dark halves move, the student can see that when midnight hits any spot the date at that spot changes.

In all, 21 Felsenthal-produced training aids are used in navigation instruction. There is an azimuth and line of position demonstrator for teaching the relationship between azimuth and LOP; a vernier scale; a great circle computation chart; star altitude curves demonstrator; navigators' log demonstrator; airspeed calibration card; Ageton solution demonstrator; aircraft plotting sheet; true altitude computer; preset bombing angle slide to fit

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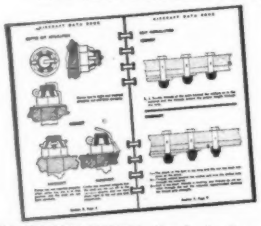

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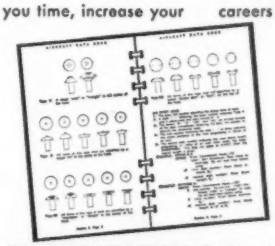

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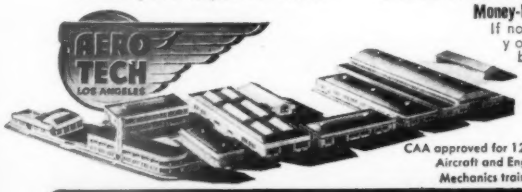

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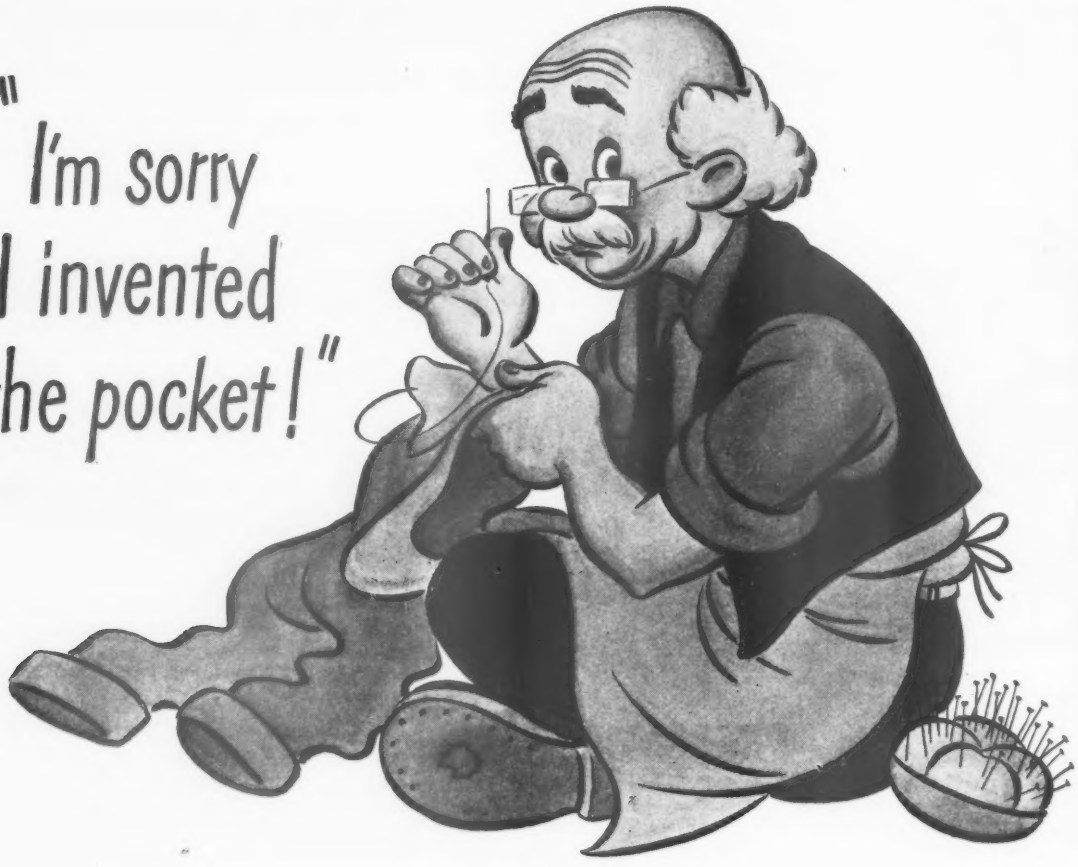

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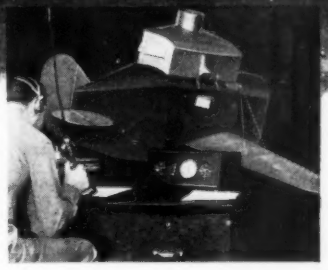

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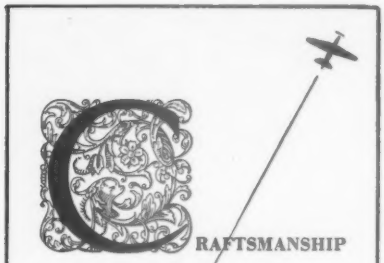

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MOTORCYCLES

(*Continued from page* 152)

the E-6B computer classroom model; distance time computer; dummy radio compass control panel; and a compass correction card.

Because of the additional classroom drilling made possible by use of the oversize models, the students attain an unusual degree of proficiency before they ever climb into a plane for their 90 to 100 hours of navigational training flights. The classroom missions on which the cadet navigator directs the course of the plane, just as he will later do in combat duty, grounds him thoroughly in navigation problems which arise at speeds of 150 to 400 m.p.h.

After visiting one of the Army's navigation training schools where the training aids were in use, the aeronautical department head of a large university declared that future college and high school courses should be built around visual aids. Other educators have been amazed at the progress the armed forces are making in teaching methods. Thus an educational technique built out of the hurried necessities of war will, in peacetime, become an important factor in revolutionizing all teaching methods. END

Converting the Coronado

(*Continued from page* 44)

To make room for these great warbirds, Rohr's 40 acres had to be expanded by 15 and a flyingboat repair base, with all attendant facilities, built at a cost of more than $325,000 in Defense Plant Corp. funds.

When all the stripping, re-routing of cables, relocating of equipment and installation of new apparatus is completed, the *Coronado* goes back into the water weighing about 8,000 pounds less. Not only does conversion make possible speedy production of urgently needed cargo craft but the cost is an estimated one-fifth the price of a new plane especially designed for this purpose, Rohr officials report.

In October and November, 1938, the first *Coronado* built, an experimental model piloted by Lieut. Comdr. Andrew Crinkley, flew non-stop across the continent twice, from San Diego to Anacostia, D. C. and return, over mountains and plains and in view of few bodies of water large enough to launch a rowboat. The west-east flight was made in the excellent time of 12 hrs. 50 min. President Roosevelt and high-ranking Army and Navy officials inspected the huge craft, which was placed on review at Bolling Field along with other military planes, and they were obviously impressed.

Later, this XPB2Y-1 became an admiral's elegantly appointed flagship on flights between San Diego headquarters, Alaska and intervening points. As the *Coronado* entered large-scale production numerous "bugs" were ironed out. Then it retired temporarily behind a curtain of oblivion which war helped sweep away as its value became appreciated through long range reconnaissance, the Wake Island bombings and the carriage of key Navy personnel.

And today, though still not as well known as the beloved "ugly duckling" two-engined *Catalina*, which preceded it at Convair's plants, the *Coronado* is being readied for transport assignments that will help bring the war to an end sooner by getting the "mostest" there first. END

Air Policy and the State Department

(*Continued from page* 33)

to look over the lip of the great technical and scientific crucible in which the machines and processes of tomorrow are being wrought out. You would see the plans of airplanes outcarrying and outdistancing any plane presently in the air. You would find engines capable of doing double, treble or quadruple the work of any existing machines. The possibility exists that human beings may be transported by air at a speed approximating that of sound.

"All of these possibilities—and some of them are already realities—have to be taken into account in dealing with foreign affairs. Even now they have changed the relative weights and values of the elements involved.

"The impact of the new processes, existing and to come, plainly changes the content of a national boundary or frontier. You can have boundaries which set limits to surface traffic by land or sea. But you do not and cannot have the same kind of boundary for the purposes of aircraft. A ship must stop when it reaches shore; a truck may be stopped by blocking the road. An airplane can only be controlled by agreement, by hostile action, or by control of landing points—a quite different conception from the old boundaries.

"There is, therefore, not only the problem of post-war international air transport, but a series of changing and complicated and interrelated problems which become more involved daily."

It is pointed out that individual or local problems and controversies, important in themselves but secondary in relation to the great picture, unquestionably will come up. The essential thing to remember is that they are, in fact, secondary when set beside the fate of an entire world civilization, and that they must not interrupt steady effort for the main objective—permanent peace.

"It will be necessary to exercise the virtues of faith and patience almost beyond measure," says Mr. Berle, "but if the principles are maintained and the objective is kept in mind, we have the right to hope that the most serious problems will find solution and that the institutions being born will draw strength from their early struggles."

Clearly, State Department officials say, the problems of war will pass into equally

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grave problems of transition, and these again will merge with the problems of organizing peace. Already the forces now active have brought up questions staggering in size and new in kind and scope. A solution can be reached only by common action. In the largest sense, they believe, the problem of international air transport cannot be soundly solved unless common international action gives to the world a reasonable probability of permanent peace. The State Department is going forward with this in mind.

Equally clear are the limitations put upon the State Department by the nature of its functions. Two questions do not come into the picture so far as State Department is concerned. One is the question of a "chosen instrument" monopoly. The other is the question of steamship or other transportation control of airlines.

These are not matters of foreign policy, hence outside State Department control. The department considers that its job is to get or make arrangements for aviation. It has to consider world peace as well as the precise national interest of getting the best for the United States. The State Department believes that this can be done. But it considers the problem of organizing American aviation a problem for Congress. Officials point out that they are bound by the Civil Aeronautics Act of 1938 which delegates that problem to another department.

"We will continue to be bound by that act until somebody changes it," one spokesman added.

As for subsidies, State's hope is that aviation may stand on its own commercial feet and that competition shall be on a commercial basis rather than on a basis of Government subsidies or loans. It is recognized, of course, that countries will wish to maintain some commercially unprofitable airlines for the purpose of communications or otherwise, and arrangements will have to allow for those.

On the affirmative side, State Department "hopes to have the freest and fullest facilities for U. S. aviation wherever we can get them."

It is the policy of the department to search for sound solutions for these manifold problems—solutions which can and will be supported by our people as being in their own interest and in the interest of all nations. State's air experts consider this "part of the greatest adventure of our time—the building of an institution of international organization — the doctrine of the Good Neighbor."

Nor do they regard it as a partisan task. Men of all parties and of all groups within parties, they emphasize, have worked and continue to work unceasingly and disinterestedly. Says Mr. Berle: "In this huge struggle to assure that victory shall also mean hope, there are no parties; there are Americans who seek for our people and for all peoples to go forward on the road of civilization." END

Model Airmen

(*Continued from page 29*)

men at one point. Eight people work on each manikin in the manufacturing process. It required two months to make the first manikin. Now, one can be turned out in 10 days.

The manikins are probably the greatest achievement in a compound movable plastic item ever developed. In addition to their great flexibility, they each weigh only 11 pounds.

Following completion of the three manikin types it was decided to make articulated ladykins for use in the design of clothing and equipment for women ferry pilots. Equipment designed for men had been found unsuitable for women flyers and it was thought advisable to reduce hazards which might result from ill-fitting garments.

A civilian at Wright Field, Dr. Alice Brues, was assigned the task of measuring the women flyers. When she had completed her measurements she collaborated with Borkland in making three statues representing average types of women pilots, A, B and C.

It was found that the "average" woman flyer Type A) is 5 ft. 4.9 in. tall, bust circumference is 35 inches and hip circumference is 38.1 inches. Type B is 5 ft. 2.5 in. high, with a 34.4-inch bust and 37.4-inch hip. Type C is 5 ft. 9 in. tall, with a 35.8-inch bust and 39-inch hip. Thirty-five measurements, including head specifications, were taken as a basis for sculpturing the ladykins, which were then produced in plastic much the same way as the manikins.

So far, only 50 plastic figures have been made. However, the project has already begun to affect the design of flight equipment. By using the statues and articulated figures it has been possible to find flaws in previous equipment and to set standards which not only aid in increasing the efficiency of flying personnel but help to reduce the number of equipment sizes in manufacturing.

For instance, the manikins were placed fully-clothed with official AAF gear in plane cockpits to determine the clearances necessary. Ankle, foot and leg positions were carefully studied to note signs of cramping. Points of stress and conflict of equipment on the flyer with parts of the plane were also noted. Comfort and safety of many types of equipment have been studied with the aid of these articulated figures.

In order to increase the efficiency of aircraft designers Borkland also made up little two-dimensional manikins on a one-eighth scale. These have movable joints so that they can be placed in any position on a drawing board and used in the preliminary design of planes before construction starts.

This entire project represents the use of contemporary anthropology to a startling degree and has been extremely useful in putting accurate data into the hands of designers and manufacturers of flight equipment. It will be further reflected in civilian life in the future design of transportation equipment. END

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I Learned About . . .

(*Continued from page 74*)

reached the cabin floor and felt the empty space where the fire extinguisher should have been, it was no surprise to me, more convinced than ever that this was to be my last flying adventure.

I switched the engine to "off," shut the gas off, and then, oddly enough, the only thing I could think of was that I would miss dinner at home that night.

Right at that moment the plane hit a tree with one of its wings, breaking the wing in two and catapulting the student out of the cabin. While he landed on the branch of another tree, which partly cushioned his fall, the plane hit, nose on, and all was oblivion. . . .

One month later, when I recovered consciousness in one of the city hospitals, the doctors told me that my student had luckily escaped with a dislocated knee and a couple of broken ribs, while I had suffered a fractured skull, a brain concussion, a cerebral hemorrhage, several broken ribs and numerous lacerations.

A year later I passed a Schneider test, but before that, three months after the crash, I had flown alone and stalled a plane, not too close to the ground, to find out what effects the crash had had on my flying abilities. Outside of a little more knowledge of aerodynamics, and the realization that you can't let a student run to the end of his rope, I found out that I was the same confident but not so careless flyer. END

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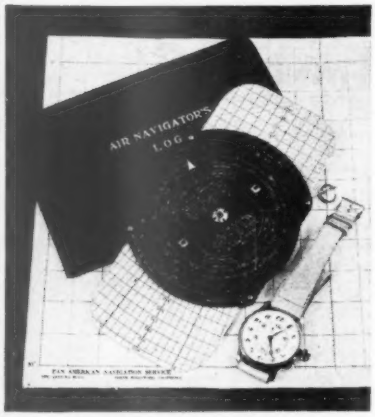

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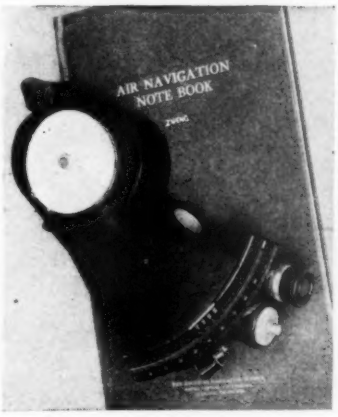

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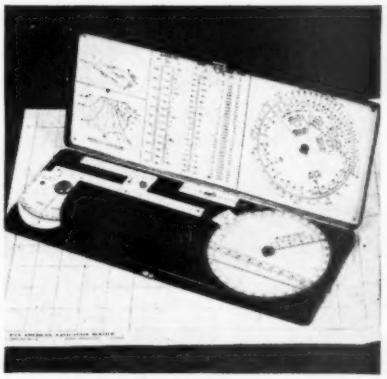

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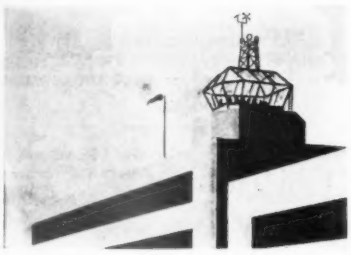

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